



***The Effectiveness of a Self-Management Educational support for People with type 2  
diabetes in Saudi Arabia***

A thesis submitted in fulfilment of the requirements for the degree of Doctor of  
Philosophy

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## **Declaration**

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Ali Hassan Alhaiti

Date: 30/06/17

## Abstract

**Background:** As pointed out by the World Health Organization (WHO), Type 2 diabetes mellitus (T2D) has become more prevalent and affected 347 million people worldwide in 2008. More than 80% of deaths associated with T2D take place in low- and middle-income countries. The International Diabetes Federation (IDF) indicated that 35 million cases were from the Middle East and North Africa, and the number of people living with diabetes worldwide is expected to reach 592 million by 2035. This study aimed to investigate the self-management and educational support area for patients with T2D in the Kingdom of Saudi Arabia (KSA).

**Methods:** To achieve the purpose of this study, a mixed methods approach consisting of three phases was determined to be the most suitable for this study. The first phase involved collecting quantitative data on T2D patients' self-care activities and knowledge about diabetes. The second phase included collection of quantitative data on nurses' and clinical educators' perceptions in KSA about care for T2D patients. The third phase of the study involved quantitative data on nurses' and clinical educators' perceptions regarding the challenges of providing self-management education to T2D patients in KSA.

**Results:** The results from Phase 1 showed an apparent statistically significant difference between level of diabetes knowledge and patients' haemoglobin A1c (HbA1c) level, age, level of education and multiple diseases. The Summary of Diabetes Self-Care Activities survey indicated that people were at healthy levels in regard to the medication and blood sugar test but at a dangerous level of self-management for diet and exercise. Phase 2, Diabetes Attitude Scale (DAS-3) survey, clearly showed that nurses and clinical educators had positive attitudes towards T2D across all five subscales but varied in their level of agreement. Finally, the results highlighted several challenges of providing self-management education support to T2D patients, which fell into a cultural theme concerning misconceptions, a sedentary lifestyle, women's needs and food habits; and a communications theme including language barriers and patient engagement.

**Conclusion:** This study presents important information to the public and health authorities in Saudi Arabia regarding type 2 diabetes management. These findings are not limited to KFMC, but should be made available to all. The study highlights that there is still room for much work to be done. This includes special training for health workers to ensure quality in the delivery of information to the public, and thus quality healthcare. Equipping healthcare personnel with the relevant information will make sure that they boost their confidence and thus their accuracy in information delivery.

**Keywords:** Saudi Arabia; Type 2 diabetes mellitus; self-management.

## **Dedication**

This work is dedicated to those who words can't express the feelings of love that I have for them; who taught me and suffered difficulties to help me get to where I am today. I would like to dedicate this thesis and everything I do to my mother, Noir.

In addition to her, I have always been surrounded by strong supportive women. One woman who accompanied me on this journey and shared with me the grief and joy, moments of tears and laughter, and suffered the difficulties and hardship of alienation was my wife, Nada.

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- Appendix F Ethics approval from RMIT University
- Appendix G Ethics approval from King Fahad Medical City
- Appendix H Translation Services Letter

## Publications

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## **List of Abbreviations**

T2D	Type 2 diabetes
CE	Clinical educator
CHD	Coronary heart disease
CI	Confidence interval
CME	Continuing medical education
CVI	Content Validity Index
DAS	Diabetes Attitude Scale
DKT	Diabetes Knowledge Test
DM	Diabetes mellitus
DSME/S	Diabetes self-management education and support
GCC	Gulf Cooperation Council
HCP	Healthcare provider
HDL	High-density lipoprotein
ICC	Intraclass correlation coefficient
IDF	International Diabetes Federation
KFMC	King Fahad Medical City
KSA	Kingdom of Saudi Arabia
LDL	Low-density lipoprotein
MENA	Middle East and North Africa
MOH	Ministry of Health
NIDDM	Noninsulin-dependent diabetes mellitus
OHA	Oral hypoglycaemic agents
RN	Registered Nurse
SDEC	Specialised Diabetes and Endocrine Centre
SDSCA	Summary of Diabetes Self-Care Activities
SMBG	Self-monitoring of blood glucose
SPSS	Statistical Package for the Social Sciences
UAE	United Arab Emirates
US	United States of America
WHO	World Health Organization

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# **Chapter 1: Introduction and Background**

This thesis covers the field of Type 2 diabetes (T2D) and perceptions towards this condition with a particular focus on self-management education support in the tertiary care setting in the KSA.

The research draws largely upon data concerning the level of diabetes knowledge; patients' adherence to self-management activity; nurses' and clinical educators' attitudes and perceptions concerning diabetes care; and challenges in providing education support. Data were obtained using a mixed methods approach. First, a quantitative approach involving questionnaires completed by nurses, clinical educators and patients was undertaken. Second, a qualitative approach involving face-to-face interviews with nurses and clinical educators from the Diabetes Centre at King Fahad Medical City (KFMC) in Riyadh, KSA was conducted.

This chapter presents background about T2D and self-management and a brief overview of the research setting and health system and diabetes healthcare services in KSA. The significance of this study, its aims, rationale, design, research questions, objectives and the structure of the thesis are also presented.

## **1.1 Background**

According to the World Health Organization (WHO, 2014), in 2008 a 347 million people worldwide have diabetes, and more than 80% of diabetes deaths occur in low and middle-income countries. In 2004, for example, around 3.4 million people died from the consequences of high levels of fasting blood sugar. According to the International Diabetes Federation (IDF), there were 382 million people living with diabetes worldwide in 2013, of whom 35 million were from the Middle East and North Africa (MENA), 56 million from Europe and 138 million from Western Pacific countries (IDF, 2013). The IDF also indicated that the prevalence of diabetes is increasing on a daily basis and the number of people living with diabetes worldwide is expected to reach 592 million by 2035. In addition, diabetes in the MENA is expected to undergo an increase of 96.2% by 2035 compared with Europe, where the incidence of the disease is set to increase by 22.4%, and the Western Pacific, where it is expected to increase by 46% (IDF, 2013).

Thus, the MENA is facing significant challenges in coming decades as the prevalence of diabetes increases. This increase is driven by a range of factors including rapid economic development and urbanisation; changes in lifestyle that have led to reduced levels of physical activity; an increased intake of refined carbohydrates; and a rise in obesity (Majeed et al., 2014). Thus, not only will diabetes become more prevalent, the burden of the disease is also expected to increase. To combat the problem, the Gulf Cooperation Council (GCC) is attempting to implement a number of treatment strategies that will minimise the rate of diabetes and control its prevalence (Aljohani, 2011). For example, KSA's Ministry of Health (MOH) implemented a national plan to combat diabetes. It is accepted that the core problem in relation to diabetes is mainly lifestyle in GCC countries, but the goal of implementing effective glycaemia control cannot be achieved without competent self-management on the part of patients (Aljohani, 2011).

In this discussion, 'diabetes' refers to T2D mellitus (T2D), which accounts for 90% of all diabetes cases worldwide (WHO, 2013). The prevalence of T2D has increased dramatically in Arabic-speaking countries over the last three decades; the prevalence rates range between 4 and 21%, with the lowest being in Somalia and the highest in Kuwait (Mohammed et al., 2012). The riches created by oil resources in GCC countries have led to upgraded standards of living along with accelerated urbanisation, extreme changes in nutrition, reduced physical activity and greater reliance on technology. The countries in question are Kuwait, Qatar, KSA, Bahrain, Oman and the United Arab Emirates (UAE). There are a number of major risk factors for the onset of diabetes and for poor clinical outcomes in diabetes patients after its commencement: genetic predisposition, family history, obesity, hyperglycaemia, hypertension, dyslipidaemia, physical inactivity, ethnicity and environmental factors (Majeed et al., 2014).

This research project focusses on self-management education support, which is a crucial approach in reducing the incidence of micro- and macrovascular complications and in instituting improvements to general quality of life. According to Al-Shahrani et al. (2012), diabetes self-management education (DSME) is a method for giving patients the information and skills required to enable them to apply self-care, manage crises and make the lifestyle changes necessary to manage the disease successfully. The major

goal of this method is to provide patients with a good chance of making themselves the first port of call with regard to managing their disease.

## **1.2 Overview of the Research Setting**

KSA is a desert nation that encompasses large parts of the Arabian Peninsula, including the Persian Gulf coastline and the Red Sea. KSA has a population of 28.83 million and a Gross Domestic Product per capita of \$54,100 in 2016 (Central Intelligence Agency, 2017). This nation is the home to the two holiest shrines for Muslims, situated in Medina and Mecca. In fact, it is the official place where Islam began. Present-day KSA was founded by Abd Al-Aziz Bin Al-Rahman Al Saud in 1932 when the 30-year old campaign for unifying the Arabian Peninsula ended. The country is currently ruled by one of the descendants of its founder as the 1992 basic law requires. From 2005 to 2015, the kingdom was incrementally modernised by King Abdallah. Driven by political pragmatism and personal ideology, the king introduced a series of economic and social initiatives including social opportunities and employment for women, expansion of the role of the private sector, attraction of foreign investors and discouragement of the practice by businesses of hiring foreign workers (Central Intelligence Agency, 2017).

## **1.3 The Health System in Saudi Arabia**

### **1.3.1 Historical Overview of Saudi Arabia's Healthcare System**

In the past, prior to the introduction of such a system in KSA, most people in the nation treated their diseases with ritualistic and traditional apothecaries (Dixon, 2002). Provision of healthcare services in Saudi was only introduced in 1926, by the Department of Health (Jannadi, 2008). This new department established a number of medical facilities such as clinics and hospitals in the major cities within the nation. One year later, the department was recognised through the attorney general's agency as the official General Directorate for Aid and Health. A council was established in an effort to improve health standards to ensure that the health of the public was not unduly affected by various infectious diseases that might be spread or introduced by pilgrimage in the country (Hassan, 2000).

The announcement of the establishment of the MOH took place in 1954, and in the 1970s, revenue generated from production of oil and its export was available to support and finance the nation's healthcare plans (Khoja & Saleem, 2001). The booming revenues from the oil sector in this period contributed to great development and expansion in the sector for healthcare services and the development of plans for human resource improvement aimed at training and educating the Saudi population. This expansion was multifaceted, including establishment of the Saudi Council of Health Services and medical colleges, promotion of scholarships and a focus on developing physicians and other types of health professionals. The outcome of these efforts is that KSA now ranks 26th on WHO's healthcare system performance measure, with the United States of America (US) and Australia at 37th and 32nd respectively (Al-Yousuf, Akerele & Al-Mazrou, 2002).

### **1.3.2 Saudi Arabia's Framework for Healthcare**

The Saudi government has a constitutional responsibility to provide all its citizens with adequate healthcare. In fact, Article 3 of the Saudi constitution states that every citizen in Saudi is entitled to state-provided healthcare (Al-Mazrou, Khoja & Rao, 2005). Although in reality there exists a stark contrast in healthcare provision throughout the country through various private and public sector agencies. The major provider of services in the healthcare sector is the MOH. Most of the country's population receives healthcare via the MOH (Alwakid, 2008).

### **1.3.3 Public Sector Healthcare**

Public services for healthcare are provided by the country's MOH at three levels: primary, secondary and tertiary care. The pathway through which healthcare facilities are accessed is primary healthcare, while the provision of tertiary and secondary healthcare services is in specialist and general hospitals respectively (Oxford Business Group, 2007).

#### *1.3.3.1 Primary Healthcare*

Mufti (2000) asserted that primary healthcare provides the first level of contact that communities, families and individuals have with a system of healthcare. In KSA,

primary healthcare includes personal care with prevention of illness, health promotion and community development.

In KSA, the primary healthcare program was implemented in a number of phases. Phase one involved the establishment of foundations and consisted of substantial training of healthcare workers at primary healthcare centres. The second phase involved rapid improvement and extension of the provision of vital indicators and services. This was followed by supportive supervision and total quality management. Phase four involved an expansion of specialised programs. The final phase comprised an in-depth revision of the whole process of primary healthcare (Clark, 2009).

#### *1.3.3.2 Secondary Healthcare*

Patients are admitted to general hospitals on the recommendation of the centres providing primary healthcare, to receive further care and treatment (Boslaugh, 2013). In 1989, the MOH established a set of procedures and policies in an effort to organise the functions of different hospitals by creating an organisation chart that provided clarification on the activities and responsibilities of various departments, staff and divisions.

#### *1.3.3.3 Tertiary Healthcare*

In certain cases where individuals may be suffering from an advanced stage of disease or illness, hospitals at the tertiary level have the capability of providing treatment with the use of state-of-the-art technology. Primary care refers patients to general hospitals, and they refer patients to tertiary hospitals for further treatment. The overall healthcare service sector in KSA is consolidated from the bottom (primary) to the top (tertiary) (Jabbour & Yamout, 2012).

### **1.4 Diabetes Healthcare Services**

The issue of diabetes in KSA is a major public health problem. Twenty % of the population in KSA has diabetes and around 23% (one-quarter) of the country's healthcare budget goes to diabetes expenditure (Robbins, 2004). The health services given to citizens with diabetes in KSA and the resulting expenditure are mostly governmental in nature rather than private.

KSA's healthcare system is growing at a rate of 2% per year to satisfy the rising demand for healthcare services brought about by increased growth of the population as well as a surge in chronic diseases (Jabbour & Yamout, 2012). Currently, patients with diabetes are managed at all three levels of healthcare by endocrinologists, internists and general practitioners. Since the care for diabetic patients involves several medical disciplines including nephrology, cardiology and ophthalmology, specialised diabetes centres and clinics are necessary to work as liaising bodies. Although at the global level there has been a shift from secondary and tertiary level to primary level management of healthcare for diabetic patients, in KSA, patients with diabetes are still receiving care services at the tertiary and secondary levels (Jabbour & Yamout, 2012).

### **1.5 Definition of Self-management in Type 2 Diabetes Mellitus**

Diabetes self-management education and support (DSME/S) is a very important element of healthcare for individuals suffering from diabetes and those at risk of developing it (Toobert, Osuna & Glasgow, 2011). Tang, Funnell and Oh (2012) stated that this education is very important in delaying or preventing complications arising from the disease. The elements of self-management are related to changes in lifestyle. These changes are also necessary for people with pre-diabetes in an effort to prevent the development of the disease. There are various standards that define the quality of DSME/S. These standards provide support to diabetes educators in the provision of education on the basis of evidence and support on self-management (Brunisholz, Briot & Hamilton, 2014). According to Weaver, Hemmelgarn & Rabi (2014), national standards are usually applicable to educators in both large multicentre programs and in solo practice. The provision of diabetes support and education is supported by many models. However, there is no particular approach recommended by the standards of self-management education (Steinsbekk, Rise & Fretheim, 2012).

DSME/S has a number of benefits. Among the major ones is cost reduction through reducing patients' admissions and readmissions to hospital and the estimated lifetime reduction in costs of healthcare in terms of reduced risk of complications (Duncan, Sherr & Boren, 2009). DSME/S provides an opportunity to reduce the high costs incurred in relation to T2D around the world. Projections show that by 2050, one in every three people will develop T2D (Fan & Sidani, 2009).

Historically, the provision of SME/S has been based on formal programs through which patients and their family members are involved in an outpatient service through a health facility or hospital (American Diabetes Association, 2015). To keep up with the evolution occurring in systems for delivery of healthcare while meeting primary care needs, this has required the incorporation of DSME/S into the healthcare sector, nursing homes and office practices. The provision of DSME/S in convenient and alternative settings like pharmacies and health centres in the community, and through programs based on technology, means it is increasing in availability and affording more access (Berwick, Nolan & Whittington, 2008).

Haemoglobin A1c (HbA1c) is one of the methods for monitoring blood glucose levels. However, Ellis, Pichert and Elasy (2004) found that HbA1c is improved by DSME/S by up to 1% in individuals with T2D. Apart from this significant reduction, DSME/S has positive outcomes for other behavioural, psychological and clinical aspects of diabetes. DSME/S is said to improve lifestyle behaviours and quality of life, and reduce the advancement or onset of complications from diabetes. In addition, DSME/s enhances empowerment and self-efficacy, reduces the presence of distress related to diabetes and increases healthy coping (Norris, Schmid & Engelgau, 2002).

Developing supporting skills and communicating necessary information to promote effective self-management and coping for daily living with the disease necessitates a comprehensive and personalised approach. Effectiveness in delivery requires experts in behavioural, psychological, clinical and educational diabetes care (Healy, Lorenz & Dungan, 2013). Effective collaboration and clear communication among members offering diabetes healthcare, which involves an educator, a provider and an individual with diabetes, is very important for setting clear goals and ensuring that progress is being made towards the goals and that the most appropriate interventions (behavioural, medical, psychological and/or educational) are being applied.

## **1.6 Rationale for the Study**

The purpose of this study is to provide an understanding of how patients with T2D can carry out various self-management and monitoring activities to help them deal with various complications associated with the disease. There is a need to ensure that patients can monitor their blood glucose levels on a daily basis. This study identifies various

ways that self-care activities and monitoring can be encouraged and improved among T2D patients. This is achieved through an understanding of current knowledge about T2D and the various factors that affect this knowledge. Also, the study focusses on how patients adhere to various self-care and monitoring activities that should be carried out on a daily basis.

Given the complexity of the disease, the perception of various healthcare professionals is important in ensuring that the right care and knowledge is shared with patients. In this regard, the study also focusses on the attitudes of nurses and their perceptions of T2D patients, and the various factors that affect these. The study is also important in providing an understanding of self-management education and how this can be improved through an understanding of the various challenges that affect its delivery.

Although there is a significant volume of literature on self-management education support in Western countries, few studies have investigated this subject in the context of the Middle East region, where KSA is located (Al-Hayek et al., 2013; Al-Shahrani et al., 2012; Midhet et al., 2013). However, all these studies concentrated on the efficiency of the intervention of self-management programs and assessed outcomes via evaluation of the effectiveness of current education support from both the healthcare team and patients.

## **1.7 Study Aim**

The aim of this study was to explore the current situation of self-management and education support for patients with T2D in KSA. The ultimate goal is to add to existing information on the knowledge and attitudes of patients towards self-management and identify the factors that influence self-management practices.

## **1.8 Research Objectives**

The objectives of the study were as follows:

- to explore perceptions and experiences of nurses about care of T2D patients in KSA
- to determine significant differences among demographic groups concerning the level of knowledge on diabetes



- to explore nurses' perceptions about the challenges of providing self-management education for T2D patients
- to evaluate patients' adherence to T2D self-care activities.

## **1.9 Research Questions**

The researcher focussed on addressing the following research questions:

RQ1: Are there significant differences among demographic groups of T2D patients in their diabetes knowledge?

RQ2: How do Saudi Arabian patients adhere to their T2D self-care activities?

RQ3: What are nurses' perceptions in KSA about care for T2D patients?

RQ4: Based on the perceptions of nurses, what are the challenges in providing education support for T2D self-management?

## **1.10 Overview of the Thesis**

The thesis consists of eight chapters. Chapter 1 has provided a summary and background of the study and presents an overview of the research setting, the health system in KSA, diabetes healthcare services, definition of self-management in T2D, and the rationale, aim, objectives and design of this study.

Chapter 2 reports on a literature review that examined the literature related to the effectiveness of self-management of T2D involving pathophysiology, prevalence, T2D and the Gulf Region, in particular KSA and the health and economic impacts; finally, it discusses remaining gaps in knowledge.

Chapter 3 describes the methodology used in this study, which is a mixed methods approach for handling data. The chapter also explains the quantitative and qualitative design of this research and presents the rationale for the approach used in each phase. Further, the chapter outlines the analysis plan for each phase and provides a comprehensive explanation of the data collection and ethical consideration procedures.

Chapter 4 presents the process for translation of the Michigan Diabetes Knowledge Test (DKT) survey (Appendix A) into the Arabic language and its validation, in Phase 1. The

chapter fully describes the translation process, which followed the WHO guidelines. Also, it presents the methods and the results for this phase.

Chapters 5 demonstrate the results from the qualitative part of the study (Phase 3). It reports the challenges of providing self-management education support to patients with T2D from the nurse and clinical educator perspective. The results are divided into five categories including an overview of the participants; patients mainly seen in the Diabetes Centre; description of the self-management education support at the Diabetes Centre; perceptions of the challenges in providing self-management education support to T2D patients; and participants' suggestions for how to deal with these challenges.

Chapter 6 presents the results of the quantitative analyses of data collected in Phase 1 and 2 using the DKT, the Summary of Diabetes Self-Care Activities (SDSCA) survey (Appendix B) and the Diabetes Attitude Scale (DAS-3) survey (Appendix C). The chapter is divided into six sections presenting 1) patients' demographic characteristics, 2) their diabetes knowledge level, 3) significant differences in the diabetic knowledge scores across patients' demographics, 4) patients' adherence to T2D self-care activities, 5) nurse and clinical educator demographic data and 6) nurses' perceptions about care for T2D patients.

Chapter 7 discusses and combines the significant outcomes of the quantitative and qualitative components of this research in the context of the current literature. In this chapter, a summary of the study is followed by a discussion of patients' knowledge of T2D in the Saudi population; demographic factors associated with this knowledge; patients' adherence to T2D self-care activities; and nurses' perceptions in KSA about care for T2D patients and the challenges they face when providing education.

Chapter 8 reports the principal conclusions obtained from the findings of the three phases of this study. The chapter identifies both the strengths and limitations of the study and presents recommendations for further study.

## **Chapter 2: Literature Review**

### **2.1 Introduction**

The prevalence of T2D in KSA is as alarming as it is in the rest of the world (Midhet & Al-Mohaimed, 2013). T2D is a chronic illness and can have fatal effects on the kidneys, liver and heart if it is not controlled and properly managed (Jain & Saraf, 2010). The Saudi population is considered at high risk of suffering from T2D due to the prevalence of various risk factors in the population that have been associated with T2D. Pharmacotherapy and alternative therapies are widely developed and used for the management of the disease. However, the importance of self-care education regarding management and control of T2D cannot be ignored and this education has shown promising effects on the quality of life of diabetic patients in KSA as well all over the world (Funnell et al., 2010).

This chapter reviews the literature related to the prevalence and effects of T2D on the Saudi population. Emphasis is placed on presenting studies conducted on assessing and describing the effects of self-management education of diabetic patients on their overall health and quality of life. Most of the reviewed literature reported research carried out over a span of five years (2009–2014) in KSA. The chapter is structured as follows: it begins by describing the search strategy and presenting information related to the KSA prevalence of T2D and its pathophysiology; the next section describes pharmacotherapy and alternative therapies; and the final section reveals the effects of self-management and self-care of T2D and the importance of the role of doctors and nurses in promoting self-management education, for example, indoor education for T2D.

### **2.2 Background**

Non-communicable diseases (NCDs), also known as chronic diseases, are defined as diseases of long duration and slow progression; they are the leading cause of death in the world, accounting for 63% of annual mortality worldwide (WHO, 2014). The four major types of NCDs are cardiovascular diseases, cancer, chronic respiratory diseases and diabetes (WHO, 2014).

T2D is among the most widely known chronic diseases and is linked with comorbidities such as cardiovascular disease, hypertension, obesity and hyperlipidaemia, which when combined encompass 'Metabolic Syndrome'. T2D results from relative insulin deficiency due to fasting, as well as post-prandial hyperglycaemia. Hence, if medical attention is not given to the patient, the hyperglycaemia may result in macrovascular and microvascular complications that include atherosclerosis, neuropathy, nephropathy and retinopathy (Jain & Saraf, 2010).

According to IDF statistics, the prevalence of T2D is an epidemic of worldwide concern. Currently, the disease has affected approximately 246 million people across the globe, with nearly 46% of the total number of affected people falling within the age bracket of 40–59 years (Jain & Saraf, 2010). Further, statistics suggest that the number of individuals living with the condition will rise to 380 million in the next 20 years if appropriate measures to prevent the disease are not implemented (WHO, 2014).

### **2.3 Type 2 Diabetes**

Diabetes is a disorder that effects the regulation of glucose level in the body, which leads to abnormally high glucose in the blood. There are four main types of diabetes, which are classified based on differences in aetiology and clinical features: Type 1 diabetes mellitus (T1DM), T2D, gestational DM and other specific types. T1DM is mostly caused by complete deficiency of insulin in the body and by damage and loss of beta cells in the pancreas. T2D is caused by insulin resistance and relative deficiency of insulin. Gestational DM is related to pregnancy. There are many other specific types of DM that are caused by malnutrition, specific genetic diseases, surgery, infections, use of certain drugs, and other illnesses (Baynest, 2015).

T2D is the most common type of diabetes (Olokoba et al., 2012). According to Olokoba et al. (2012), T2D accounts for ~90–95% of all reported cases of DM. T2D is characterised mostly as an environmental and lifestyle risk factor-associated illness. It usually affects people over 40 years of age but can also affect younger adults and sometimes children. In most cases, T2D remains asymptomatic for many years and diagnosis is often accidental or when complications occur. T2D patients are not dependent on insulin treatment and are not prone to ketosis. However, in some cases,

insulin is used to control hyperglycaemia if this is not achieved with oral medication or diet alone.

### **2.3.1 Prevalence of Type 2 Diabetes**

According to the WHO, 347 million people worldwide currently have diabetes, and more than 80% of diabetes deaths occur in low- and middle-income countries. In 2004, for example, an estimated 3.4 million people died from the consequences of high levels of fasting blood sugar, a situation that was repeated in 2010 (WHO, 2014). According to the IDF, there were 382 million people living with diabetes worldwide in 2013, of which 35 million were from the MENA, 56 million from Europe and 138 million from Western Pacific countries (IDF, 2013).

The IDF also indicated that the prevalence of diabetes is increasing on a daily basis and the number of people living with diabetes worldwide is expected to reach 592 million by 2035. In addition, diabetes in the MENA is expected to undergo an increase of 96.2% by 2035; whereas in Europe, the incidence of the disease is set to increase by only 22.4%, and in the Western Pacific, by 46% (IDF, 2013).

Thus, the MENA are facing significant challenges in the next two decades as the prevalence of diabetes increases. This increase is driven by a range of factors including rapid economic development and urbanisation; changes in lifestyle that have led to reduced levels of physical activity; increased intake of refined carbohydrates; and a rise in obesity (Majeed et al., 2014).

### **2.3.2 Type 2 Diabetes Pathophysiology**

T2D is a disorder characterised by decreased sensitivity of muscle and fat cells to insulin, progressive dysfunction of pancreatic beta cells and uncontrolled glucose production by the liver (Barr, Myslinski & Scarborough, 2008). DM is a major chronic health condition that relates to elevated blood sugar levels (Midhet, Al-Mohaimeed & Sharaf, 2010). Insulin is a hormone that carries glucose from the blood to body cells (Wilcox, 2005). It functions to decrease blood glucose levels to within a normal range by increasing glucose delivery to cells, stimulating storage of excess glucose and inhibiting the production of glucose from glycogen in the liver (Wilcox, 2005).

### **2.3.3 Type 2 Diabetes Mellitus and the Gulf Region, in Particular Saudi Arabia**

DM remains one of the major health challenges experienced in KSA and other countries across the globe. Currently, a high percentage of young people are sufferers of T2D due to lack of exercise, obesity and poor diet (El-Bab, Zaki, Mojaddidi, AL-Barry & El-Beshbishy, 2013). With T2D, sufficient insulin is created but not enough glucose is transported to the body cells (Wilcox, 2005).

Currently, the situation of T2D in KSA is dire, as ~32% of the entire population has this type of diabetes (Al-Daghri, 2011). This is an alarming figure and means that KSA citizens are exposed to one of the most chronic medical conditions.

There are various factors that are considered risk or trigger factors for T2D. These factors, which include obesity, excess fat around the waist, high cholesterol, high blood pressure and increased consumption of sugary food and drinks, are prevalent in most countries including KSA. Age is also considered a risk factor and studies suggest that people above 50 years of age are at high risk of suffering from T2D, as is the case in KSA. A large number of people living in urban areas of KSA are diagnosed with T2D due to environmental pollution (Alqurashi, Aljabri & Bokhari, 2011).

As an oil-producing country, KSA is adversely affected by T2D as most of the people have moved to urban areas where a new lifestyle with less exercise and poor diet has been adopted (Iqbal, 2013). Reliance on machines and reduction in physical activity has led to the increased level of T2D in KSA. Another factor that may contribute to the increased prevalence of T2D in the Gulf and among Saudi women is the fact that a high proportion of Saudi women are obese. This is because they have particularly low physical activity levels due in part to strong sociocultural norms. These norms restrict women's participation in any kind of sport, educational or career pursuits and they are confined in their home with little or no physical activity (Berger, 2009). According to Berger, the hot climate is another factor that limits outdoor activities for both men and women in KSA and this plays a crucial role in the decreased physical activity and increased obesity in the population.

Further, according to Berger (2009), high smoking rates, emotional stress due to an increased urban lifestyle and the presence of maids to carry out their chores are additional factors that affect the health of the Saudi population and increase their risk of

obesity. Finally, there have been changes in the types of food being consumed. People prefer to eat out or have takeaway meals rather than following a more healthy diet. These factors contribute to the increase in obesity level. Thus, not only will diabetes become more prevalent, but the burden of the disease is also expected to increase (Majeed et al., 2014).

#### **2.3.4 Health and Economic Impacts of Type 2 Diabetes**

T2D has a number of health and economic implications at the individual level and for national health institutions and the entire country. T2D is associated with a number of health complications such as blindness, renal failure, depression, heart disease and unhealthy eating habits (Al-Hayek et al., 2013). The health implications are strongly adverse to the extent that T2D affects the physical, psychological, social and mental domains of health for many citizens in KSA. The quality of life for many citizens in KSA has been affected by T2D and this has led to early mortality (Al-Hayek et al., 2013) because T2D is a leading cause of myocardial infarction and other cardiovascular disease, and kidney complications and failure (Tancredi et al., 2015).

According to Alhowaish (2013), apart from the health effects of T2D, there are various economic impacts of the prevalence of T2D in populations where this disease is present. The citizens and national government spend a great deal of money in the treatment of this and other chronic health conditions including arthritis, stroke, cancer and heart disease. The prevalence rate of T2D in KSA is very high and this means that substantial resources are committed to ensure that T2D is prevented and treated; the government spends ~11% of its income in treatment and prevention of T2D (Alhowaish, 2013). This means that a huge budget is allocated to health expenditure related to T2D in KSA. Individuals with T2D incur higher medical expenses than those who are not diagnosed with T2D (Alhowaish, 2013). The economic costs associated with T2D are huge and are a burden to the citizens of KSA.

#### **2.3.5 Alternative Complementary Therapies for Type 2 Diabetes**

Treatment of T2D involves various elements such as traditional medications, natural remedies and alternative therapies (Diabetes Health Centre, 2014). According to the National Centre for Complementary and Alternative Medicine, complementary and alternative medicines refers to a diverse group of medical and healthcare systems,

products and practices that are not at present considered part of conventional medicine (Diabetes Health Centre, 2014).

The non-pharmacological complementary therapies for T2D include proper dieting, physical activity, lifestyle change and mental conditioning. Examples of other alternative treatments include herbal remedies, cinnamon, acupuncture, chiropractic treatments, green tea, gymnema, guided imagery, relaxation exercises, biofeedback, chromium, massage and aromatherapy (Nahas & Moher, 2009). The use of medicinal herbs for the treatment of various chronic diseases has never become obsolete and it has played a significant role in human healthcare. According to the findings of Habeck (2003), around 1,200 plants have been claimed to be associated with the treatment of diabetes; around 400 of these have been reported to prove beneficial in the treatment of T2D (Singh et al., 2011). It is important to note that complementary medicine is used alongside conventional treatments, whereas alternative medicine is not (Diabetes Health Centre, 2014). The use of alternative complementary therapies is effective whereas in certain cases alternative medicine has not shown significant benefits (Nahas & Moher, 2009). A patient using complementary treatments is supposed to inform their healthcare provider (HCP).

### **2.3.6 Pharmacotherapy for Type 2 Diabetes**

Oral medications (pharmacotherapy) used for the treatment of T2D are generally referred to as oral hypoglycaemic agents (OHAs). Six major classes of OHA are available for the control and treatment of T2D (Moses, 2010): sulfonylureas, meglitinides, biguanides, alpha-glucosidase inhibitors, dipeptidyl peptidase IV inhibitors and thiazolidinediones. Pharmacotherapy for T2D is a major development in KSA and other countries that has helped to reduce the level of T2D in KSA (Sorli & Heile, 2014). The success of pharmacotherapy for T2D is attributed to the use of hypoglycaemic agents such as glimepiride, metformin, repaglinide, acarbose and sitagliptin (Moses, 2010).

The use of sulfonylureas enhances production and release of insulin and this helps to maintain normal sugar level. The use of new agents in the treatment of T2D is a significant measure that increases secretion of insulin, delays absorption of carbohydrates and improves insulin action (Sorli & Heile, 2014). Hypoglycaemic agents



improve secretion of insulin and others act as insulin secretagogues (Sorli & Heile, 2014). In some patients, metformin is used to increase the level of glucose absorption. The use of disaccharide inhibitors is significant in pharmacotherapy for T2D as it reduces production of sugars (Sorli & Heile, 2014). Indeed, hypoglycaemic agents help reduce the level of blood glucose in T2D. It is recommended that hypoglycaemic agents are combined with lifestyle change and proper diet to help the patient control blood glucose (Sorli & Heile, 2014).

Insulin therapy is a critical and widely used treatment for T1DM and also in cases of T2D. The administered insulin is intended to maintain the level of glucose within an ideal range. The insulin is injected into the fat layer under the skin via a syringe, insulin pump or insulin pen. Insulin therapy is used to help people with T2D to regulate sugar in their blood and enhance storage of excess glucose. Insulin is available in different strengths, and U-100 is commonly used (Sorli & Heile, 2014). People with T2D make insulin through beta cells, which are available in the pancreas. However, the body of a person with T2D responds poorly to insulin, hence the need for insulin injections. Insulin treatment therefore involves injection of insulin into the blood stream and this helps to control the amount of blood sugar (Al-Daghri, 2011). Insulin treatment and the use of hypoglycaemic agents is associated with side effects such as allergy, lumps due to insulin injections, rashes and weight gain.

Along with the development of pharmacotherapy for the management of T2D, the importance of self-care education in T2D patients has emerged as a significant factor. Self-care parameters of diabetes include regular monitoring of blood glucose levels, diet control, taking medications on time and in proper doses, exercise and foot care, problem solving ability and positive coping skills. These parameters are considered vital in the control and management of T2D and doctors and health practitioners are advised to provide detailed and proper education to T2D patients to promote self-care and management of their disease (Shrivastava et al., 2013). According to Shrivastava et al. (2013) the increase in physical activity and control in intake of a high fat diet can have significant effects on the control and management of the symptoms and pathophysiology of T2D. Midhet et al. (2010) also emphasised the importance of a healthy lifestyle, physical activity and controlled diet in the control and management of diabetes.

### **2.3.7 Patients' Knowledge of Type 2 Diabetes**

With cases of T2D increasing at such a high rate, it has been necessary for patients to gain knowledge on the treatment and self-management of the disease. According to Al-Dahan et al. (2013), the disease accounts for more than 90% of all the diagnosed cases of diabetes, and in most cases, more than 50% of patients have had the disease detected lately. The rate of growth of the disease has been very high, meaning that there is a need for both patients and unaffected people to be armed with the necessary knowledge to manage and prevent the disease.

Based on previous studies, a high percentage of patients have some knowledge about the disease and the various self-care management practices they are expected to carry out. However, Al-Maskari et al. (2013) argues that the majority of patients lack in-depth knowledge of the various complications that result from the disease.

According to Al-Aboudi, Hassali and Shafie (2016), most T2D patients treat their disease using various approaches including diet and insulin as advised by their medical professional consultant. This includes either injecting themselves with insulin or taking medications that they have been prescribed by their doctors. For some, treatment-related activities are usually carried out by family members or nurses who have a better understanding of how to carry out the activities and who have a more in-depth knowledge of the disease and the treatment measures that should be taken. Therefore, there is a relatively high rate of knowledge about the various management practices that patients need to adhere to with regard to T2D.

Most patients have a good understanding of the main symptoms of T2D. According to Al-Maskari et al. (2013), more than 70% of patients understand that the main symptoms include frequent urination, increased thirst, blurred vision and weight loss. There is also a high rate of knowledge about the various late complications of the disease, including diabetic foot, kidney impairment and stroke. Even though the majority of patients understand this only after consultation with medical professionals, this shows that they can easily recognise progression of the disease and hence are able to take the necessary measures as advised.

There is a high rate of knowledge among T2D patients about the various activities that they should avoid and those they should carry out to ensure that they live a healthy life.

Al Shafae et al. (2008) argues that most people suffering from the disease have a good understanding that they need to avoid habits such as smoking and drinking alcohol, as these are some of the factors that can lead to more complications as a result of the disease. Given that most patients suffer from high blood pressure, a high proportion of them know that it is advisable for them to regularly check their blood pressure and to avoid activities that may trigger high blood pressure. Although many patients have weight issues, some (albeit a low percentage) monitor their body weight and take the various expected measures to control their weight.

Regarding diet, there is high knowledge among the majority of patients about which foods they should remove from their diet. Most patients, particularly those who have consulted medical professionals due to the complexity of their disease, know that they must manage their diet to maintain blood sugar at acceptable levels. There is also a high level of knowledge that managing their diet leads to a reduction in cardiovascular diseases (Al Shafae et al. 2008). However, Al-Maskari et al. (2013) argue that knowledge of the fact that management of diet leads to a reduction in weight—which may reduce the complications that result from T2D—is lower, and the same is true for knowledge that dietary management reduces the chances of suffering the various late complications that result from T2D.

### **2.3.8 Demographic Factors Affecting Knowledge among Type 2 Diabetes Patients**

One of the main factors affecting the knowledge level of T2D patients is their level of education. According to Murata et al. (2003), highly educated patients are more aware of the various recommended self-care management practices that reduce the effects of the disease than are those with low levels of education. This is because having a higher education level means that one is more exposed to knowledge about T2D including the decisions one should take with regard to diet, exercise, weight control, blood level glucose and medication use.

Another demographic factor that affects knowledge among patients with T2D is the duration of the disease. According to Fenwick, Xie, Rees, Fingers and Lamoureux, (2013), people who have had the disease for longer have been exposed to information and knowledge that helps them to manage the disease through various self-care management practices compared with those who have had the disease for a shorter

duration. Therefore, people who are new to the disease do not possess enough information to understand how to carry out various self-care management practices and obtaining that information and acquiring the necessary knowledge takes more effort.

The income level of patients also affects their knowledge of how to manage the disease. This is because a high income means that patients have better access to high-quality healthcare and can access better information on how to self-manage the disease than do those with lower income levels (Al-Aboudi, Hassali & Shafie, 2016). This means that high-income patients can carry out better self-care management practices than low-income patients.

Cultural practices and beliefs are other demographic factors that affect patients' knowledge about the management of T2D. Adejoh (2014) argues that, due to their cultural beliefs and their own beliefs, patients who have developed a negative attitude towards the disease and its various complications have low knowledge about management of the disease. This leads to such people being more vulnerable to these complications.

Another factor that affects knowledge about the self-care treatment practices with regard to T2D is gender. Jasper et al. (2014) states that research has found that females are more proactive when it comes to gaining knowledge and information about self-care practices than are males. This places females in a better position to manage the disease than their male counterparts.

### **2.3.9 Patients' Adherence to Type 2 Diabetes Self-Care Activities**

Self-activities help ensure that there is a reduction of the effects of T2D on the human body. According to Abu Sabbah & Al-Shehri (2014), good self-care helps maintain good glycaemic control. This means that there is a need for patients to adhere to the various self-care activities that are recommended to them by their healthcare professionals. This includes observing various patient behaviours that are expected, including living a healthy lifestyle that includes physical exercise, healthy eating, reduction in tobacco consumption and weight management. Another change that is expected is carrying out various disease self-management activities such as self-medication and self-monitoring of glucose levels.

In most cases, patients need to implement various self-care activities either for themselves or with the help of close family members. Kamel, Ismail, El Deib and Khattab (2003) argue that more than 95% of T2D cases require self-care activities that include changing their lifestyles to reduce the complications that are associated with the illness. Hence, patients require a good understanding of self-care activities they should observe on a daily basis so that they can survive the associated complications of the disease.

Research has found that around a third of patients do not have an understanding of the various early symptoms of the illness. According to Jordan and Jordan (2010), there is a need for patients to understand the various symptoms of the disease at different stages so that they know which self-care activities they need to carry out at any given time. According to research, there is poor adherence to various self-monitoring activities that T2D patients are expected to undertake. According to Mohd, Phung, Sun and Morisky (2016), a range of factors affect the level of adherence to self-care activities and these may be social, economic or cultural.

One of the factors that affects patients' adherence to self-care activities is their education level. According to Elzubier, Al-Amri, Al-Haraka and Abu-Samara (1996), patients with low levels of education have lower adherence to self-care activities than do those with higher levels of education. This is because less-educated patients may find it more difficult to understand treatment recommendations from healthcare professionals than do those with higher education levels. This means that among the less well-educated patients, there is lower adherence to self-care activities.

Family support is very important in ensuring that there is adherence to self-care activities among patients. Al-Aboudi, Hassali, Shafie and Saleem (2016) argue that families provide motivation that plays a therapeutic role and hence ensures that there is an increase in adherence to self-care activities. Accordingly, there is a high adherence level among patients who have good family support, compared with patients who have less family support. Family and friends support patients to ensure they are motivated to make the right decisions, follow various recommendations made by healthcare professionals and undertake the various lifestyle changes that are expected.

Another factor that affects adherence levels to the various recommendations is poverty level. Poverty tends to influence various aspects including level of education and affordability of high-quality healthcare. Poor-quality healthcare means that patients do not receive appropriate recommendations for self-care activities that they should carry out and this may lead to non-adherence to expected self-care activities and self-monitoring activities. People who have higher income levels have access to high-quality healthcare where they receive the best recommendations on various self-care activities that they need to carry out. This increases the level of adherence to recommended self-care and self-monitoring activities (Huang, Zhao, Li & Jiang, 2014).

One of the ways in which patients can be motivated to adhere to various self-care management activities is through the use of nursing consultants who can provide individuals with the necessary training for self-care and self-monitoring. Aljohani, Kendall and Snider (2015) argue that nursing consultants ensure that patients are well equipped with the necessary skills and knowledge about the need to carry out various self-care activities and to change their lifestyle to ensure they suffer fewer complications from the disease.

Self-medication is a self-care activity that the majority of patients disregard. Research has shown that more than 50% of patients do not take their medications and thus become prone to more complications. As one of the basic self-care activities that patients need to carry out, there is a need to ensure that patients appropriately use medications as prescribed by their healthcare professionals (Xu, Pan & Liu, 2010).

### **2.3.10 Nurses' Perceptions and Attitudes about Care for Type 2 Diabetes Patients**

Given the continued increase in the number of cases of T2D in various parts of the world, there is a need for increased attention by healthcare professionals, especially nurses, in offering the necessary care to patients suffering from the disease. With increase in cases of T2D being experienced in all parts of the world, this has become an urgent issue that needs to be addressed. Clark (2009) argues that improvements in the quality of care from nurses can help in the reduction of mortality from the disease. It can also ensure that the various associated complications are reduced, and patients can live a comfortable life for longer.

For most countries in the world, the quality of care by nurses and other healthcare professionals, especially in the public health sector, has been very poor. According to Fitzgerald et al. (2008), this is due to the attitudes of healthcare professionals towards diabetic patients and the attitudes of patients towards service providers. This has resulted in a reduction in the rates of adherence to self-care management activities that patients should practice on a daily basis, and a reduction in the daily self-monitoring of blood glucose level that is essential.

Given that in the healthcare setting, nurses spend the most time with patients, they are better positioned to provide better education and offer more care to T2D patients than are other healthcare professionals. Also, nurses are usually better positioned than other healthcare professionals, such as doctors and physicians, to recommend to patients the best care practices and the various measures that they should take to manage the disease. Lou et al. (2014) argues that nurses are better listeners and have better knowledge of diabetes patients than other healthcare professionals. This means that their attitude and commitment to the care of T2D patients should be higher than that of other healthcare professionals.

Research has shown that nurses have the lowest attitude and perception about care of T2D patients. One example is their attitude and perception towards the seriousness of the disease. Nurses' decisions to improve the patient management and care they offer to patients are greatly motivated by their perception of how serious a disease is. This means that if nurses perceive a disease to be very serious, they will ensure that they offer more specialised care and that the quality of patient care is very high (Anderson, Fitzgerald, Gorenflo & Oh, 1993). If they perceive a disease to be less serious, then they will offer lower quality care, and will be less concerned about offering care services. Given that most nurses have come across other diseases that they consider to be more deadly than T2D, there is a lower perception and attitude among nurses with regard to how serious the disease is. This means that with respect to care for people with T2D, nurses have a lower attitude towards offering good services as their efforts and concerns are directed more to patients they consider to have more serious diseases.

Offering quality care to T2D patients requires specialised training to provide the necessary knowledge on the day-to-day self-care management and monitoring activities that should be carried out. This also helps with gaining knowledge about various

lifestyle changes that diabetes patients should make so to minimise associated disease complications. According to Odili and Oparah (2012), nurses who have specialised training in the care and monitoring of T2D patients have a better attitude and perception towards their patients than do those who have not received such training. This is because they have a better understanding of the needs of these patients and good knowledge of the various care activities that need to be carried out for these patients. Hence, nurses' perception and attitudes towards care for T2D patients is greatly influenced by whether or not they have received specialised training with regard to the disease.

Another aspect that affects nurses' attitudes about the care of T2D patients is their attitude towards the value of blood glucose management on a daily basis. One of the most important factors for T2D patients to monitor on a daily basis is their blood glucose level as this can greatly influence their health because T2D is a result of high blood sugar levels compared with insulin levels in the blood. For nurses who value the need to control blood glucose levels on a daily basis, their perceptions and attitudes towards the care of T2D patients are very high. This is the opposite for nurses who do not see the value of controlling blood glucose levels on a daily basis. Nurses who value control of blood glucose levels understand the need to have such care offered to patients and they have no issues with doing so (Bisheya, El-Mijbri, Beshyah & Sherif, 2011). Those who do not appreciate the need to control blood glucose levels on a daily basis may not wish to provide such care services to diabetes patients; hence their lower attitude and perception.

The perception of nurses towards the effects of the disease on patients is another factor that influences the perception and attitude of nurses about care for T2D patients. If they perceive the effects on patients as substantial, they offer high-quality services and have a positive attitude towards offering care and monitoring patients on a daily basis. If they perceive the effects on the daily life of the patients to be minimal, then they may end up having a lower attitude and perception towards the need for care for T2D patients (Sharp & Lipsky, 2002). This is because the seriousness of a disease affects the level of care and the attitude nurses have towards offering care to patients: those with less serious diseases receive less care and attention than do those with diseases that are perceived to be more serious.



The autonomy of patients with regard to diabetes is another factor that may affect nurses' perception with respect to the disease. For most healthcare professionals, including nurses, it is believed that day-to-day self-care and self-monitoring activities should be carried out by patients and hence they should receive the necessary training and should be empowered to do this (Babelgaith, Alfadly & Baidi, 2013). This is because patients are the ones who experience the various bodily effects and are thus in better positioned to take the necessary measures, if they are well educated about what to do.

### **2.3.11 Challenges in Providing Self-Management Education Support to Patients with Type 2 Diabetes**

T2D is a chronic and complex disease that requires patients to undertake daily care activities to control the effects of the disease on their body. Given the complexity of the care needs of patients, they are expected to gain the necessary knowledge about how to carry out various care activities on a daily basis so as to manage the disease. Patients need to gain the skills, knowledge and abilities that are necessary for them to undertake self-care and monitoring activities on a daily basis, via DSME. There are various challenges that a DSME program may face and that may determine a patient's knowledge of the various activities that need to be carried out.

One of the main challenges that affects the provision of DSME/S to patients is the language barrier. According to Al-Khathami, Kojan, Aljumah, Alqahtani and Alrwaili (2010), T2D is a global disease that is affecting people from various parts of the world, both literate and illiterate. This means that when healthcare professionals and patients do not speak the same language, the challenge of this language barrier may mean that the relevant information, skills and knowledge are not effectively delivered to the patients, affecting their ability to carry out daily self-care activities as expected.

Cultural differences are another challenge that may influence effective DSME for patients. Norouzinia, Aghabarari, Shiri, Karimi and Samami (2016) argue that some cultures have various practices that may hinder the delivery of relevant information and knowledge to enable effective self-care. For example, Muslim women are expected to strictly adhere to a range of cultural practices; nurses and other healthcare providers who are not Muslim may have little understanding of what is hindering the effective

delivery of necessary information and knowledge to patients. In some cultures, female patients cannot be treated by male doctors or people who are outside their culture, which may mean that information about self-care activities is not delivered effectively to such diabetes patients. This means that such patients are not able to take care of themselves and this may complicate the effects of their disease.

Gender differences are another factor that may affect the delivery of DSME to patients. This is mainly due to the special needs that women have compared with men, which may be biologically or culturally driven. Daoud et al. (2015) argues that when a healthcare professional does not have a good understanding of their female patients, especially from the cultural point of view, the effectiveness of the delivery of information about how to carry out various self-care activities may be reduced. Thus, such women may not be able to self-monitor or self-manage on a daily basis, which may eventually lead to increased complications as a result of the disease.

Misconceptions have arisen among people from various cultures and communities about T2D. These misconceptions have led to people developing beliefs that may affect their knowledge of how to carry out self-care management and monitoring. Adejoh (2014) considers this a factor that may affect the delivery of self-monitoring and self-management knowledge to patients, as care providers must first discourage patients from holding such misconceptions before they can be offered new knowledge on how to take care of themselves, including how to monitor their blood glucose levels on a daily basis. If this is not done effectively, patients may end up doing things that do not help in the management of the disease, leading to more complications.

One of the main causes of T2D is a lack of physical exercise. This leads to a person living a sedentary lifestyle that includes little or no physical activity. According to Hu, Li, Colditz, Willett and Manson. (2003), this is another factor that may affect the delivery of knowledge on the various self-care activities that patients are expected to carry out. A sedentary lifestyle can lead to various lifestyle diseases including T2D. This means that even if patients receive knowledge on how to self-manage and monitor their blood glucose levels, but continue living a sedentary lifestyle, the process will be ineffective as it will not assist in the management of the disease but will lead to increased complications from the disease.

Compliance with the various activities and lifestyle changes that one needs to carry out to manage the disease is another factor that may affect the delivery of knowledge about the day-to-day management of the disease. Even if the patient is provided with all the knowledge about the disease and how to carry out the management activities, if they do not comply with the requirements then the whole process becomes ineffective and the patient may face complications from the disease (Elkharam, Khatri, Wallymahmed, Gee & Elhisadi, 2013). This is particularly the case for people who have a busy life and have no time to comply with requirements such as engaging in various physical activities or avoiding specific lifestyle activities and practices. Other social and lifestyle factors may affect the compliance of patients with the various lifestyle and monitoring practices. For such people, non-compliance results in the knowledge gained being ineffective as it does not help them to effectively manage the disease.

### **2.3.12 The Significance of Self-care and Diabetic Management Education in Controlling Type 2 Diabetes**

Of the many diseases that afflict humans all around the world, diabetes is one that requires self-care and management as part of the maintenance and treatment process (Midhet & Al-Mohaimeed, 2013). Self-care or self-management is a set of necessary regulatory functions deliberately performed and initiated by patients that operates concurrently with medical treatment. In a way, self-care is somewhat akin to preventive medicine as the goal in both is to prevent the onset of more serious disease. Self-management and self-care seek to alleviate complications associated with a present condition (such as diabetes) or with the advancement of disease into an acute state. The modern approach to chronic conditions involves self-management and education, aimed at ensuring that patients live the best possible quality of life despite their chronic condition (Midhet & Al-Mohaimeed, 2013).

Various studies have been carried out to investigate the relationships among self-care, quality of life and outcome of the disease in patients, revealing a positive correlation among the three. For instance, Alshehri (2010) reported that self-management was highly instrumental in reducing the amount of HbA1c among T2D patients. HbA1c is a widely used test for the evaluation of diabetes and it reflects the average glucose level in the blood over the previous 6–8 weeks. This test is included as a routine test for T1DM and T2D patients and it aids in determining the effectiveness of any treatment plan

including exercise, medication or dietary changes. High levels of HbA1c are alarming and are indicative of poor control of the disease, and vice versa. The study further revealed that when blood monitoring was performed along with self-management activities, such as foot care and exercise, this improved reduction of H1bAc levels. More importantly, blood monitoring was demonstrated to be the primary key factor in the reduction of H1bAc, since it provides a means for patients to gauge the results of their self-management practices. Blood monitoring also provides motivation as it allows patients to gain an insight into how their condition is progressing.

Further, according to Aljohani (2011), 'the fact that only 15% of participants had controlled glycaemic level despite a high level of dependence on medications is very good evidence that medication alone, is not the complete answer to the effective management' (Aljohani, 2011, p. 4). In another study, Al-Shahrani et al. (2012) indicated that use of medication alone to control T2D is not an ideal approach. Improved adherence to medications was one of the most important observed results among the many desirable outcomes. Education and information dissemination is another key component of self-management. The study by Al-Shahrani et al. (2012) revealed that even with minimal or no supervision, subjects exhibited improvement in their lifestyle and self-management practices, which resulted in controlled and improved condition and quality of life.

A number of studies have been carried out that focus on the importance of self-care activities in diabetic patients to improve the quality of their lives and control their T2D. According to Ismaeil and Mostafa (2012), health education for the management and self-care of T2D needs to be enforced. They selected 400 diabetic patients and analysed them for carrying out self-care practices and determined the effect of these practices on their overall health. The self-care activities analysed included regular monitoring of blood sugar, regularity in taking medication, foot care, exercise and diet control. Ismaeil and Mostafa's (2012) study suggested strong points of their research with the concept of effective self-care practices and implementation. Patients must learn to understand and value the importance of independence as much as possible, especially during the treatment process of their disease or illness. Together with independent self-care management techniques, discipline in adhering to self-care practices should also be observed. The study summarily noted that adherence to all self-care practices related to

T2D was quite low and the authors highlighted the need for enforcement of health education for diabetic patients. The study also noted that younger, unmarried male participants and non-smokers were observed to have better self-care activities and they concluded that diabetic patients with better self-care activities have better control of the disease.

Self-monitoring of blood glucose (SMBG) was the main point considered in a study by Al-Randi, Bouftain, Al-Enezi and Kamel (2009). The study involved patients with all kinds of diabetes. The authors suggested that continuous SMBG led to positive results in the patients' blood sugar levels. The research was similar to that of Ismaeil and Mostafa (2012). Both studies emphasised the significance of self-monitoring or self-care management. Blood glucose is the main factor to consider in patients suffering from T2D. These patients must be cautious about their diet and activities to maintain healthy levels of blood sugar. Al-Randi et al. (2009) suggested that, if monitored well, blood glucose levels in the patient's system should improve. The study was carried out over one year and involved 438 participants with diabetes. Like other studies described above, Al-Randi et al. (2009) concluded that educating patients leads to improvements in their health, particularly in relation to blood sugar.

Similarly, Zechariah, Sarfo and Nondo (2014) pointed out the importance of awareness of a health condition from which one is suffering. Awareness is vital for patients suffering from any type of disease (Heydari, Ziaee & Gazrani, 2015). Without awareness, a patient will not be able to obtain a clear concept of what is happening and what should be done to treat their sickness. In addition, the study emphasised the significance of effective health education.

Each research topic is equipped with its own strengths and weaknesses. In any kind of research endeavour, careful consideration must be given to the different factors involved. The most crucial and definitive parameters that affect the health and credibility of any research should be carefully chosen, including the number of participants (sample size), the age of the participants, the setting in which the research is conducted and the duration of the research.

The major shared finding across the research is that there is much improvement in T2D patients who undergo self-management education. These same patients become more

cooperative and tend to recover sooner than those who are not able to participate in health education programs. However, there is a need for ongoing research to fill gaps. This includes exploration of nurses' and patients' perception of self-management education intervention.

### **2.3.13 Remaining Gaps in Knowledge**

Various studies have also been based on the importance of self-care activities in T2D patients but with certain shortcomings and flaws that challenge their credibility. For instance, Al-Hayek et al. (2013) observed the effects of an education program on patients with T2D. The research found that after six months of diabetes education, there were significant improvements in dietary plans, physical exercise, SMBG, HbA1c, adherence to medication and depression. Although six months is considered sufficient for short-term studies, the long-term effect of patient education was not considered. Indeed, the literature review identified a considerable knowledge gap regarding the long-term effects of this intervention.

Midhet and Al-Mohaimed (2013) researched the effects of patient education, focussing on the lifestyle of patients with chronic disease and on 'indoor' education (Midhet & Al-Mohaimed, 2013). Indoor education refers to guidance and education provided by doctors and nurses when a diabetic patient has been admitted to a hospital and has spent a few days or weeks in the controlled environment of the hospital. Midhet and Al-Mohaimed (2013) reported that patients admitted to hospital improve their diet and physical activity after they have been discharged. Midhet and Al-Mohaimed's research did not focus on T2D patients; instead they examined patients with various chronic illnesses in their analysis including hypertension, coronary heart disease (CHD), stroke, arthritis and asthma. The research identified that there was a minimal effect of education on patients' diet and physical activity after discharge, in contrast with the findings of Al-Hayek et al. (2013). Among the studies reviewed, Midhet and Al-Mohaimed's (2013) study is the only one to claim that health education does little to improve diet and physical activity in T2D patients. However, this study had a limitation: the sample size was small compared with studies such as Midhet and Al-Mohaimed (2013), which may affect the credibility of its findings.

A different approach to studying patient education was taken by Mohameda, Al-Lenjawi, Amunad, Zotore and Elmahdif (2013). They observed 430 patients over a period of 12 months and data regarding their health and self-care activities were collected. The results included a remarkable decrease in HbA1c, fasting blood sugar, body mass index and albumin to creatinine ratio. There was also an improvement in diabetes knowledge, attitude and practice.

Compared with the studies described above, Mohameda et al.'s (2013) research is more reliable because of the larger scope of participants and the longer timeframe over which the study was conducted. The results were also very specific about which variables were substantially affected as a result of patient education. The authors were also able to consider the setting in which their research was conducted in such a way that they respected the culture of the patients involved. Additionally, a study by Hawthorne, Robles, Cannings-John and Edwards (2008) paid attention to culturally appropriate health education that included various ethnic minority groups in high-income and upper-middle class countries. These groups experience limited socioeconomic benefits and have high incidence of T2D in their populations. The aim of the research was to impart awareness and health education in 1,603 patients with T2D. The researchers found that proper health education about T2D in these groups had a short-term effect on people in controlling their disease and in understanding the needs of a healthy lifestyle.

The shortcomings of most studies were they were short term and did not include an economic analysis of each approach to control T2D. There is a need to carry out long-term research on various ethnic minority groups to better understand the effects of self-care of T2D.

## **2.4 Data Sources and Search Strategy**

The components of this review considered studies that published in English and touch on patients from KSA, specifically those with T2D. The articles considered were published in 2009–2014. The databases searched included MEDLINE, PubMed, CINAHL and Google Scholar.

First, key words (Table 2.1) relating to self-management education in the treatment of T2D were considered to ensure that all relevant studies were included. These included

‘Saudi Arabia’, ‘type 2 diabetes mellitus’, ‘chronic condition’ and ‘self-management’. These key words were organised into sets, yielding a different number of search results, as shown in Table 2.1.

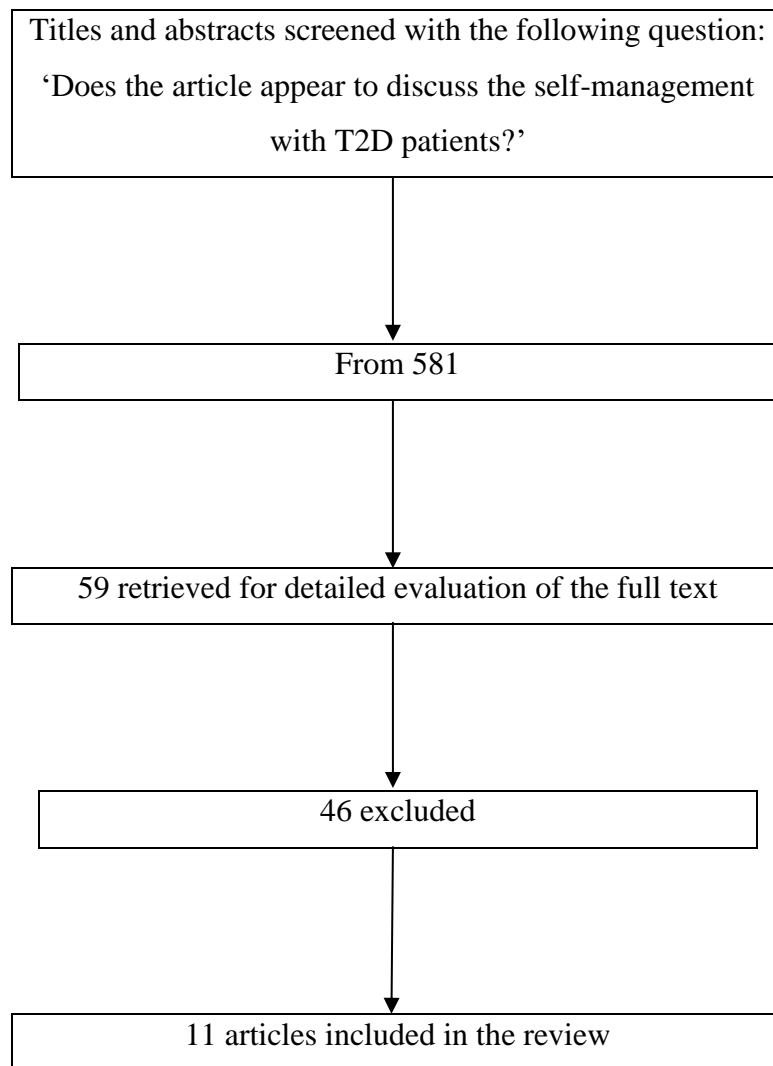
**Table 2.1: Search key words**

Search query	PubMed Result	MEDLINE Result	CINAHL Result
‘Saudi Arabia’ and ‘Type 2 diabetes mellitus’	133	153	11
‘Saudi Arabia’ and ‘chronic condition’ and ‘self-management’	8	0	0
‘Saudi Arabia’ and ‘Type 2 diabetes mellitus’ and ‘self-management’	4	1	0
Total	310		
Search query	Database	Result	
‘Saudi Arabia’ and ‘Type 2 diabetes mellitus’ and ‘self-management’	Google Scholar	271	

## 2.5 Results

Results were subjected to vetting to ensure that articles appeared to discuss self-management concerning T2D patients. Of the generated 581 search results (Table 2.1), 59 studies were retrieved for evaluation of details. Of these, 46 were excluded because the content did not relate to self-management concerning T2D patients. Thus, 11 articles were included in the review. Figure 2.1 summarises the course and procedure of vetting, and inclusion criteria.





**Figure 2.1: Flow diagram of the search strategy and selecting the appropriate studies**

**Table 2.2: Summary of research articles selected for the analysis of effects of practising self-management of Type 2 diabetes**

Author	Design	Sample	Results
Al Asmary et al. (2013)	Uncontrolled quasi-experimental intervention study with pre–post assessment	<i>N</i> = 41 adult patients (M & F) >18 years of age with T2D who received diabetic care at a chronic disease clinic	Triglycerides, HbA1c, FBG and total cholesterol were found to be significantly reduced by 16.0%, 18.5%, 21.0% and 15.5% respectively. The decrease in the amount of HbA1c was also observed to be negatively affected by the presence of other diseases (25.7% for those with diabetes without comorbidities or other contributing diseases; 12.6% for those with cardiovascular disease and/or dyslipidaemia; and 0.3% for those with kidney disease/problems). Further, while the level of low-density lipoprotein (LDL) was reduced by 10.5%, high-density lipoprotein (HDL) and blood pressure levels showed no change in the post-intervention stage.
Al-Hayek et al. (2013)	Prospective cohort study	<i>N</i> = 104 (71 M, 33 F) patients afflicted by diabetes who received care from a major tertiary hospital in Riyadh, KSA (originally there were 113, but 9 withdrew within the 6-month duration of the study)	The education program effectively increased the number of patients who followed the prescribed dietary program from 12.9% to 39.4%; the number of patients who performed a minimum of 30 minutes of workout increased from 11.5% to 41.3%; and patients who took the initiative to monitor their own blood glucose levels increased from 21.1% to 44.2%; thereby effectively establishing a positive correlation between educational programs and glycaemic control among diabetic patients.

Author	Design	Sample	Results
Al-Hayek et al. (2012)	Cross-sectional study analysis	<i>N</i> = 147 (99 M, 48 F) patients identified as having T2D and aged 18–70 years	<p>On average, subjects were found to be diagnosed with DM after 12.7 years with a margin of error of 7.3 years. The data revealed that 91 of the patients with uncontrolled glycaemic level (<math>HbA1c \geq 7\%</math>) failed to follow the prescribed dietary plan, which signifies that self-care management practices observed among patients with poorly controlled DM are poorer. The data further revealed that 87% of the patients did not participate in any physical activity that lasted 30 minutes, and 90% did not conduct SMBG. The size of the sample limited further evaluation of the correlation between depressive symptoms and T2D; however, patients were observed to have significantly higher levels of anxiety and depression on the Hospital Anxiety and Depression Scale.</p> <p>Overall, the study revealed that poor diabetes self-care management behaviour, elevated levels of anxiety and depression, and low adherence to medicine were correlated with poor glycaemic control.</p>
Aljohani (2011)	Phase 1: Survey research Phase 2: Survey research Phase 3: Survey research/interview	Phase 1: <i>N</i> = 243 (first sample = 33; second sample = 210) Phase 2: <i>N</i> = 210 Phase 3: 36 (24 T2D patients and 12 HCPs)	<p>The study revealed that the locations used in this study did follow the international self-management recommendations set out by the American Diabetes Association. Further, self-care outcomes were revealed to be affected by factors such as the characteristics of the communities and T2D patients, the healthcare system and the Saudi Arabian culture.</p>
Al-Kadi (2012)	Meta-analysis	n/a	<p>Preliminary research revealed that although the spread of chronic diseases like diabetes is increasing in developing countries and GCC states, resources remain limited and continue to dwindle over time.</p> <p>Of the challenges and factors affecting healthcare in KSA, one of the</p>

Author	Design	Sample	Results
Al-Shahrani et al. (2012)	Naturalistic observation	<i>N</i> = 438 (280 M, 158 F) patients	<p>most influential is the terrain (which is mostly desert), which hampers or delays the delivery of the aforementioned services. Thus, the MOH only provides healthcare to 60% of the population. The remainder receives the required services from other government institutions and from private sectors and agencies.</p> <p>The study established, overall, that there is a need to enlist and employ the services of telecare for the management of diabetes in KSA, as healthcare authorities are now considering it close to becoming an epidemic. Telecare is believed to expand the reach of healthcare services and improve its efficiency.</p> <p>The subjects exhibited significantly positive results after a year, including improvements in body weight, blood pressure (both systolic and diastolic), fasting blood sugar, triglycerides, total cholesterol and LDL. Although improvements in HDL levels were observed, they were not significant. The results demonstrated the efficacy of an intensive education program provided by a trained and professional healthcare team in instituting changes in lifestyle and bringing about positive changes in the health of diabetic patients.</p>
			<p>The study revealed that self-management correlates with improvement (or positive effect) of clinical outcomes (e.g. significant reduction in HbA1c). The reduction in H1bAc (to ≤7%) was best attributed to SMBG, exercise and foot care. Of these three factors, the most influential in terms of achieving the target H1bAc level was SMBG. Those who engage in diabetes self-management were also observed to require fewer health services; self-management did not interfere patients' day-to-day activities.</p>
Alshehri (2010)	Non-experimental retrospective cross-sectional survey research design	<i>N</i> = 412 patients	

Author	Design	Sample	Results
Ismaeil & Mostafa (2012)	Case control study	<i>N</i> = 400 diabetic patients registered at two primary healthcare centres in Abha City, KSA	<p>In general, the study revealed that diabetes self-care for patients in all components was low. Of the components of diabetes self-care, the most frequently performed by patients was foot care and specific diet. Further, the study revealed that the younger the patient, the higher their engagement in diabetes self-care. Of the components of diabetes self-care, male patients tended to prioritise more general diet and exercise while female patients tended to engage more in foot care. Education was also shown to correlate with better self-care. The difference in how educated and non-educated patients engaged in self-care was significant in all areas except diet.</p> <p>The study revealed that male physicians scored better than female physicians, and rural physicians scored better than urban physicians. This means that male and rural physicians were better and more knowledgeable than female and urban physicians respectively.</p>
Khan et al. (2011)	Cross-sectional survey	<i>N</i> = 122 Physician	<p>The study also revealed that the weakness of physicians with regard to DM was with its epidemiology. Further, more than a quarter of physicians did not know diagnostic criteria for T2D. In addition, only 34.7% of the physicians knew the angle at which insulin injection must be correctly administered. The tendency of physicians to agree to diabetic self-management education was inversely correlated with experience: those with 1–5 years of experience tended to agree with it while those with more experience tended not to.</p>
Midhet et al. (2013)	Qualitative interview	<i>N</i> = 169 Patients	Indoor education had an insignificant effect on the physical activity and diet of patients after they were discharged from hospital.

Author	Design	Sample	Results
Zechariah et al. (2014)	Review	N/A	Prompt medical intervention was the key to reducing the risk of complications with T2D. The intermediary factor, however, that hampered T2D patients from receiving this was lack of awareness. In addition, most T2D patients were insufficiently informed about the need to control glucose, their management targets and the conditions associated with the disease. Stigma about the condition faced by patients was also a key factor as it prevented people from tackling the issues or from seeking out relevant information and educational programs.

## 2.6 Discussion

Although there are areas in KSA that are yet to benefit from educational programs about T2D and self-management, advances in information technology and the promise of establishing support and assistance remotely through various communication tools offers another layer of promise for patients (Midhet & Al-Mohaimed, 2013). For instance, Al-Hayek et al. (2012) showed that there is a marked difference between the percentage of patients following a prescribed diet or exercise routine after they are subjected to an educational program. These are the two most important factors in glycaemic control, but patients find it difficult to institute changes in these factors. The aforementioned study strongly established a positive correlation between educational programs and glucose control among diabetic patients. The benefits derived from educational programs are realised through improvement in self-management practices. This shows that self-management is not only an effective tool in addressing the growing number of T2D patients but is also a significant part of T2D treatment to ensure that patients can return to as many normal life activities as possible before diagnosis.

Activities and programs designed to educate and inform patients also provides them with avenues for socialisation and release of anxiety and tension. The overwhelming emotional effect of diabetes is a factor that demotivates a patient from improving or continuing with their self-care activities. A study performed by Al-Hayek et al. (2012) demonstrated the negative effects of depression and anxiety on self-care management. The study highlighted the fact that poor self-care management, depression and anxiety have been observed to correlate with poor glycaemic control.

The type of education program and the timing of its administration do not appear to matter. All forms of education program, including DSME, delivered at every stage of the disease have been observed to produce positive results in self-care management. According to Funnell et al. (2010), DSME facilitates the skill, knowledge and ability of diabetic patients to practise self-care. The objective of this education program is that a diabetic patient develops abilities in decision making, problem solving, self-care behaviours and active

interaction with their healthcare department. An interview study by Midhet and Mohaimeed (2013) analysed the effect of indoor education on the management of T2D.

The idea of solely depending on medical authorities when it comes to dealing with chronic diseases such as T2D has also been identified as controversial (Midhet et al., 2013). This is not only because of the limitations of medical practitioners and the present technology to cure the disease, but also because of lack of knowledge about how important self-management education can be. Khan et al. (2011) stated that most physicians in various hospitals do not consider diabetic self-management education to be an essential part of diabetic care. This is alarming because, while doctors' personal biases dictate otherwise, data from various studies reveal the importance of self-management education.

Overall, studies agree that self-management must be an essential part of a T2D patient's life (Funnell et al., 2010; Midhet et al., 2013). According to McEwen, Pasvogel, Gallegos and Barrera (2010), not only does self-management of T2D through various education programs benefit a patient, it does not significantly interfere with a person's lifestyle or activities. Self-management results in reduced incidence of mortality, reduced utilisation of public resources for the disease, improved life quality and better control of the condition (Midhet et al., 2010). The reviewed studies favour the need to educate both diagnosed patients and the healthy population to prevent onset of diabetes. The government is thus left with no excuse not to strengthen self-management education programs, which will encourage people to participate in self-management activity.

Although careful and critical analyses were performed on the 11 studies, as they are observational and vulnerable to the existing beliefs and biases of the proponents (even though they tried to eliminate these), full confidence in the results cannot be readily attained. However, the agreement among these studies, backed by experimental results, is sufficient to provide reliable conclusions. The conclusion derived is not only consistent but points to a single recommendation: the institution of educational intervention as a preferable or indispensable element of diabetes patient care.

The most important conclusion to draw from these studies is that self-management education is a crucial and vital component of T2D treatment and that its benefits and its



role, both in facilitating recuperation and restoring the quality of life of patients, is undeniable. There is unanimous agreement across all 11 reviewed studies that self-management education is an effective strategy and has been successfully used by T2D patients for some time. Moreover, it could also be concluded that self-management education is a critical success factor in diabetes patient care in general.

## **2.7 Limitations**

The small number of studies is a limitation of this review. Further, only one study was a randomised clinical trial that provided experimental evidence, which is a more serious limitation because observational studies do not contribute as much in terms of evidence. Other limitations include the restriction of the search to English language publications within the last five years (2009 to 2014).

## **2.8 Conclusion**

In conclusion, statistics from the WHO reveal that 347 million people globally are diagnosed with diabetes, and more than 80% of diabetes deaths occur in low- and middle-income countries. The IDF statistics highlight the fact that diabetes cases in middle-income nations are on the rise each day; thus the forecast indicates a significant increase given the modern lifestyle changes being experienced in such societies. Around 90% of most diabetes cases globally are due to DM, a good example being Arab-speaking countries characterised by drastically improved living standards that have created changes in society and the mode of life. It is evident that the use of self-management education as an approach towards reducing various incidences of macro and microvascular complications yields positive results. This is through its influence on patients in terms of equipping them with skills and relevant information to enable them properly to monitor and control their disease at a personal level.

## **2.9 Summary**

This chapter reviewed the literature relating to self-management of T2D, the role of doctors and nurses in promoting self-care and the effect of practising self-care activities on the

health of T2D patients in KSA. The following points summarise these key points as well as the primary gaps in the literature that need to be addressed:

- T2D is among the most widely known chronic diseases linked with various complications including cardiovascular, neuropathic and nephropathic effects.
- T2D patients who are well educated about self-management of T2D lead a better life with fewer complications of T2D.
- It was established that doctors and nurses of KSA should play a central role in providing guidance to their patients and encourage them to gain a proper education about the management and self-care of T2D.
- Young people and non-smokers were found to gain the most from practising self-management activities.
- Various factors related to the environment, socioeconomics and lifestyle of the Saudi population increase the risk of people suffering from T2D. Thus, adopting a healthy and active lifestyle and gaining an education about self-management of T2D can reduce the drastic effects of this disease.
- Most doctors and nurses pay little or no attention to guiding T2D patients about the importance of practising self-management of T2D; hence, appropriate research as well as training of doctors and healthcare practitioners is required to promote the cause.
- Some studies have quite small sample sizes that cannot be considered representative of the whole population; thus, there is a need to carry out more studies with larger sample sizes and for longer periods to provide a detailed and accurate view of the situation (Table 2.2).
- Only one reviewed study was a randomised clinical trial that provided experimental evidence, which is a more serious limitation because observational studies do not contribute as much in terms of evidence.
- The restriction of the search to English language publications within the last five years (2009–2014) can also be considered a shortcoming of this literature review as the data collected and reported within these studies cannot be considered completely representative of the real picture of T2D in the KSA population.

## **Chapter 3: Methodology**

### **3.1 Introduction**

A research methodology is a framework or model utilised to prepare, implement and analyse a study. The ultimate goal is to answer a research question around a hypothesis, so it is important to have an extensive understanding of the various types of research designs available (Valmi, Martha et al., 2007). This chapter provides an overview of the methodology that was implemented to achieve the aim of this research project. In addition, it outlines the methods used and describes the many steps undertaken to complete the quantitative and qualitative phases of this mixed methods study.

The chapter includes sections on the chosen research design, the aims and objectives of the study, the research questions formulated in line with the study and the research setting. Sections also address the population of the study, the sampling and recruitment strategies, the research instrument, the reliability and validity of the survey instruments and the data collection procedures.

### **3.2 Research Design**

To achieve the purpose of this study, a mixed methods approach was determined to be the most suitable. Mixed methods research is defined as ‘the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts, or language into a single study’ (Johnson & Onwuegbuzie, 2004, p. 17). In mixed methods studies, the researcher investigates a particular topic and discusses the research problem by collecting, analysing and integrating quantitative and qualitative data (Small, 2011). Using a mixed methods approach allows researchers to measure quantitatively study variables and analyse existing relationships while integrating qualitative research to achieve a deeper understanding of the research problem (Pearce, 2012). Using a mixed methods approach is also recommended to overcome the potential limitations associated with using one method, be it quantitative or qualitative (Fielding, 2012). However, the use of a mixed methodology has its own concerns, especially in

relation to the skills and resources required to conduct both types of methodology in the one study. The complications of using multiple methodologies and frameworks will be encountered particularly if the results from one methodology do not match the results from the other. However, there is general agreement among researchers that using a mixed methodology can increase the validity and reliability of study results (Salehi & Golafshani, 2010).

Based on the aims of this study, the researcher conducted a mixed methods study with a cross-sectional comparative design. The researcher collected quantitative data from nurses and patients of the KFMC SDEC. These data were in regard to their knowledge, attitudes and perceptions of diabetes and diabetes self-care management. Qualitative data were collected through individual interviews with nurses and clinical educators about their perceptions regarding the challenges of providing self-management education to T2D patients in KSA. In mixed methods studies, the quantitative and qualitative processes can be conducted at the same time or sequentially. In this research study, a triangulation design allowed the researcher to conduct both quantitative and qualitative studies at the same time.

### **3.3 Research Aim**

The aim of this study was to explore the current situation of self-management and education support for patients with T2D in KSA. The ultimate goal is to add to existing information on the knowledge and attitudes of patients towards self-management and identify the factors that influence self-management practices. To achieve these goals, this research study was divided into three phases. The first phase included collecting quantitative data from patients with T2D on their self-care activities and knowledge about diabetes. The second phase included collecting quantitative data from nurses and clinical educators on their attitudes towards diabetes and the self-management of this condition. The third phase included collecting qualitative data from nurses and clinical educators on their perceptions regarding the challenges of providing self-management education to T2D patients in KSA.

### **3.4 Research Setting**

The study was conducted in KFMC in KSA which considered as one of the largest healthcare facilities in the Gulf Region, with a total capacity of 1,200 beds. KFMC consists of four hospitals, specifically the Main Hospital with a capacity of 181 beds, the Maternity Hospital with a capacity of 120 beds, the Paediatric Hospital with a capacity of 224 beds, and the Rehabilitation Hospital with 92 beds. These four hospitals treat more than 19,171 inpatients and over 238,404 outpatients annually (KFMC, 2016). The KFMC also contains 17 fully equipped operating rooms and has the largest number of intensive care beds in the Gulf Region. In addition to these hospitals, KFMC contains primary care clinics and Faculty of Medicine and Medical Centres, which include the Prince Salman Heart Centre, the National Neuroscience Institute, the Prince Sultan Haematology and Oncology Centre and the SDEC (KFMC, 2016).

According to its human resources database, KFMC has a total of 3,295 Nursing Department staff. Among them, 24 are employed specifically in the SDEC. The SDEC staff also includes 18 medical doctors, 4 clinical educators and 2 dietitians. The SDEC includes a Diabetes Centre with a Diabetes Clinic, a Health Education Clinic and a Nutrition Clinic. Statistics for 2015 indicated that the SDEC Diabetes Centre treated a total of 6,899 patients, with 3,453 patients specifically in the Diabetes Clinic. The Health Education Clinic served 3,240 patients, while the Nutrition Clinic served 206 patients.

The Diabetes Centre comprises several divisions, including nursing, health education and nutrition, in addition to doctors' clinics. Self-management health education is obligatory for all health practitioners and has been assigned to a separate department named the Health Education Clinic, to ensure this professional purpose is met. As part of their treatment, all patients with T2D are scheduled for education support after their first appointment with their doctor. The Health Education Clinic provides information on T2D through face-to-face sessions, group sessions or in other ways such as videos, pamphlets, email correspondence or phone conversations. During the education session, the patient is provided with information about their condition and how to manage it. The sessions are

conducted by members of the health team, which include nurses, clinical educators and dietitians.

### **3.5 Population and Sampling**

#### **3.5.1 Phase 1—Quantitative Survey (Patients)**

Phase 1 of this study included a quantitative survey conducted among patients in the SDEC Diabetes Centre. Based on hospital data from 2015, the SDEC Diabetes Centre served a total of 6,899 patients. Among them, 3,453 were treated at the Diabetes Clinic, while 3,240 were treated at the Health Education Clinic and 206 at the Nutrition Clinic. The population for Phase 1 of this study comprised mainly the 3,240 patients served at the Health Education Clinic. From this population, a convenience sample of 385 participants was targeted for recruitment. A convenience sampling technique was utilised to identify participants for the study. This is a non-probability sampling method wherein participants are chosen based on their willingness and availability. An invitation to participate in the study was distributed at the entrance to the department, close to the waiting area for patients, to recruit proposed participants for the study (Saunders, Lewis & Thornhill, 2012).

##### *3.5.1.1 Inclusion Criteria*

To be eligible for this study, participants had to meet the following inclusion criteria: (1) a patient at KFMC, (2) at least 20 years old, (3) diagnosed with T2D, (4) received educational support on the self-management of T2D through KFMC's SDEC and (5) able to read and write in Arabic or English.

##### *3.5.1.2 Exclusion Criteria*

Based on the inclusion criteria described above, individuals who met the following descriptions were excluded from participating in this study: (1) less than 20 years old, (2) not diagnosed with T2D, (3) diagnosed with T2D but had not received educational support on the self-management of T2D through KFMC's SDEC, (4) diagnosed with T2D, at least 20 years but not receiving treatment through KFMC's SDEC, and (5) could not read and write in Arabic or English.

### **3.5.2 Phase 2—Quantitative Survey (Nurses)**

Phase 2 of this study involved a quantitative survey conducted among nurses in KFMC. Based on hospital data, the KFMC employs a total of 3,295 nurse able to switch between jobs in different departments, including the SDEC Diabetes Centre. The population included all nurses in KFMC and from this population, a sample of 1,695 participants was targeted for recruitment. This sample size calculation was based on the recommendations of Odili and Oparah (2012) according to calculations based on subscale standard deviation of scores among professionals, varying from 0.65 to 1.05. In consideration of the desired 95% confidence level for a 0.05 margin of error, a sample size of 1,695 is required.

#### *3.5.2.1 Inclusion Criteria*

To be eligible for this study, participants had to meet the following inclusion criteria: (1) employed as a full-time nurse at KFMC, (2) 21–60 years of age, (3) at least one year of working experience and (4) able to read and write in Arabic or English.

#### *3.5.2.2 Exclusion Criteria*

Based on the inclusion criteria described above, individuals who met the following descriptions were excluded from participating in this study: (1) not employed on a full-time basis at KFMC, (2) less than 21 or more than 60 years of age, (3) less than one year of working experience and (4) cannot read and write in Arabic or English.

### **3.5.3 Phase 3—Qualitative Interviews (Nurses and Clinical Educators)**

Phase 3 of this study included face-to-face semi-structured interviews with nurses and clinical educators from the KFMC SDEC. Based on hospital data, the SDEC employs a total of 48 staff members, which includes 24 nurses. The 24 nurses in the Diabetes Centre comprised the population for Phase 3. From this group, the researcher recruited 10 participants, including the head of the Diabetes Education Department at KFMC. According to Morse and Field (1995) the philosophy of qualitative research is to collect data until saturation occurs and no new information is obtained. Recruitment occurred until data saturation was reached, which was after 13 interviews.

#### *3.5.3.1 Inclusion Criteria*

To be eligible for this particular phase of this study, nurses had to meet the following inclusion criteria: (1) 21–60 years of age, (2) a nurse at the KFMC SDEC Diabetes Centre, (3) working at the SDEC Diabetes Centre for at least one year and (4) able to read and write in Arabic or English.

#### *3.5.3.2 Exclusion Criteria*

Based on the inclusion criteria described above for this particular phase in the study, nurses who met the following descriptions were excluded from participating in this study: (1) less than 20 or more than 60 years of age, (2) employed in KFMC, but not in the SDEC Diabetes Centre, (3) worked for less than one year in the SDEC Diabetes Centre and (4) cannot read and write in Arabic or English.

### **3.6 Recruitment**

This study was conducted in the SDEC in KFMC during the period 10 August 2015–30 January 2016.

#### **3.6.1 Phase 1—Quantitative Survey (Patients)**

Potential participants for Phase 1 of this study included patients diagnosed with T2D and receiving educational support on the self-management of their condition. To recruit participants, the researcher first obtained permission from the head of SDEC. As part of patient recruitment procedures, the researcher remained in the Diabetes Centre of KFMC's SDEC and approached patients who were receiving educational support on their T2D diagnosis. The researcher briefly explained the purpose of the study and provided each patient with an information package. The information package contained the formal invitation letter for the study, two copies of the informed consent form and copies of the DKT and the SDSCA-Arabic. Two copies of the informed consent form were provided because one was signed by the participant and returned to the researcher, while the other was for the participant to keep.



The invitation letter and the informed consent form contained relevant details about the study such as its purpose, the nature of participation expected from study participants, the time commitment required and the inclusion criteria for the study. The invitation letter and the informed consent form also contained the researcher's contact details for potential participants who may have had questions about the study. The informed consent form also outlined the policies and procedures that were implemented to protect participants' privacy and data confidentiality.

### **3.6.2 Phase 2—Quantitative Survey (Nurses)**

To recruit participants for Phase 2 of this study, the researcher obtained permission from the head of SDEC and the Nursing Department to contact their nurses through email to invite them to participate in the study. Once permission was granted, the Nursing Department sent an invitation via email to nurses listed in the hospital. Attached to the email was a copy of the informed consent form. The invitation letter and the informed consent form contained pertinent details about the study, such as its purpose, the nature of participation and time commitment expected from study participants and the inclusion criteria for the study. The informed consent form also outlined the policies and procedures that were implemented to protect participants' privacy and data confidentiality. At the end of the invitation email, nurses were asked to obtain the survey package from the researcher if they were interested in participating in the study. After signing the informed consent form and completing the survey questionnaire, participants were asked to place the sealed survey package in a box located in the Nursing Department.

### **3.6.3 Phase 3—Qualitative Interview (Nurses and Clinical Educator)**

Participants for Phase 3 of the study were recruited through the data collection procedures for Phase 2. At the end of the DAS-3, an invitation to the interview phase was included. Participants who were interested to participate in the interview session had to tick the 'yes' option on the survey and provide their contact details to be contacted by the researcher for the interview schedule. It was clearly indicated that the researcher would conduct individual, face-to-face interviews and that these interviews would be audio recorded for data collection and analysis purposes.

## **3.7 Data Collection Instruments**

### **3.7.1 Phase 1—Quantitative Survey (Patients)**

For Phase 1 of this study, data were collected using two quantitative surveys: the DKT and the SDSCA-Arabic (Aljohani, Kendall & Snider, 2016). Permission to use these survey questionnaires was obtained from the respective authors (Appendix D). The DKT is a 23-item instrument designed to assess patients' knowledge of diabetes, especially with regard to diet, exercise, blood glucose levels and testing, and self-care activities (Al-Maskari et al., 2013). The first 14 items are applicable to all diabetics, while the last 9 items are applicable only for those who are taking insulin. Scores for the DKT can range from 0 to 14, quantified based on how many items the participants are able to answer correctly. The DKT was selected because it provides an effective, efficient and inexpensive way to assess a patient's current level of knowledge on diabetes (Sweileh et al., 2014). The DKT was considered appropriate because it provided an objective measure of participants' knowledge on diabetes (Sweileh et al., 2014). In this study, the DKT used is a version that the researcher translated to Arabic using the translation and validation process recommended by the WHO (2017).

The second instrument that was administered to the patients was the SDSCA. Permission to use the SDSCA was obtained from Aljohani et al. (2016) (Appendix E). The SDSCA was chosen because in its original form, it was evaluated as an easy-to-use instrument with acceptable psychometric properties to measure specific domains of self-management of diabetes. The instrument is composed of two parts. The first part consists of 11 items about self-care activities with regard to five subscales: diet (four items), exercise (two items), blood glucose testing (two items), foot care (two items) and smoking (one item). Except for the item on smoking, respondents of the SDSCA were asked to identify how many days within the past week that they performed the specified self-care activity. To respond to these items, respondents were asked to use a continuous scale ranging from 0 to 7 (Aljohani et al., 2016). The second part of the SDSCA includes items on HCP interventions regarding diet, exercise, blood glucose testing and medication.

### **3.7.2 Phase 2—Quantitative Survey (Nurses)**

For Phase 2 of this study, data were collected using the DAS-3 developed by the Michigan Diabetes Research and Training Center (Al-Maskari et al., 2013). Permission to use this survey questionnaire was obtained from the respective authors (Appendix D). The DAS-3 can be administered to both patients and healthcare professionals to assess general attitudes towards diabetes. The DAS-3 consists of five subscales pertaining to perceptions on diabetes and its management. These subscales are the need for special training; seriousness of NIDDM (noninsulin-dependent diabetes mellitus); value of tight control; psychosocial impact of DM; and patient autonomy (Al-Maskari et al., 2013). Nurses were asked to indicate their level of agreement with the 33 statements in the instrument based on a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

### **3.7.3 Phase 3—Qualitative Interviews (Nurses and Clinical Educator)**

Phase 3 of this study involved individual face-to-face interviews, which were conducted using a semi-structured interview guide formed of open-ended questions. These questions were developed based on the objectives of this research. During the interview, follow-up questions were also asked for participants to clarify or provide more details. Using open-ended questions allowed the participants to express their perceptions using their own words and provided opportunities for the participants to introduce aspects of the topic that might not be discussed if the researcher had opted to use close-ended questions (Irvine, Drew & Sainsbury, 2013). The use of open-ended questions was also recommended to allow participants to respond to the questions with as much or as little detail as they felt comfortable with (Cachia & Millward, 2011). Aside from this, the use of a semi-structured interview guide helped the researcher ensure that all aspects of the topic relevant to the study were discussed during the interview and all information needed to address the research questions was collected (Doody & Noonan, 2013).

### **3.8 Content Validity**

#### **3.8.1 Phase 1—Quantitative Survey (Patients)**

Data for Phase 1 of the study were collected using two instruments: the DKT and the SDSCA-Arabic (Aljohani et al., 2016). Both instruments in their original forms were designed in English and were developed for use in research studies written in English. The researcher translated the DKT to Arabic based on the translation and validation process prescribed by the WHO (2017).

The second instrument used in Phase 1 of this study was the SDSCA-Arabic. A research study was conducted on the process used to translate the instrument and the psychometric properties of the translated version. As with the other instruments, translation of the SDSCA into Arabic was conducted using the translation and validation procedures recommended by the WHO (2017). The results of the study provided Cronbach's alpha values for the four subscales as follows: diet,  $\alpha = 0.89$ ; exercise,  $\alpha = 0.83$ ; blood glucose testing,  $\alpha = 0.92$ ; and foot care,  $\alpha = 0.77$  (Aljohani et al., 2016). The Cronbach's alpha value for the whole instrument was  $\alpha = 0.77$ . Test-retest reliability was determined to have  $r = 0.912$ , with  $p < 0.001$  (Aljohani et al., 2016). Thus, the SDSCA-Arabic was considered adequately reliable for this study.

#### **3.8.2 Phase 2—Quantitative Survey (Nurses)**

Data for Phase 2 of the study were collected using the DAS-3 (Al-Maskari et al., 2013). As with the other quantitative instruments, the DAS-3 was developed for use in the English language. The scale properties of the DAS-3 were evaluated using Cronbach's alpha. The results of the reliability analysis indicated  $\alpha = 0.78$  (Al-Maskari et al., 2013), which was considered adequately reliable for this study.

#### **3.8.3 Phase 3—Qualitative Interviews (Nurses)**

To validate the semi-structured interview used in this study, the researcher arranged an expert panel composed of five members, two of whom were academic members and three from a medical background (nurse, medical doctor and pharmacist). The expert panel was

asked to evaluate the interview guide in relation to the research questions in terms of the clarity of the questions and the appropriateness for collecting the data needed to address the research questions. Based on the comments of the expert panel, revisions were made to the interview guide to enhance clarity and understandability, and the revised version of the instrument was used in the individual interviews. A pilot study was conducted prior to actual data collection to ensure that the questions on the interview guide directly addressed the qualitative research questions of the study.

### **3.9 Data Collection**

#### **3.9.1 Phase 1—Quantitative Survey (Patients)**

During recruitment for Phase 1, potential participants were provided with an information package that contained the formal invitation letter to the study, two copies of the informed consent form and the study instruments. Patients who were interested to participate in the study were asked to complete the DKT and the SDSCA-Arabic at their convenience. Completed forms were returned in the envelope provided with the information package, along with a signed informed consent form. The envelopes were placed into a box in the Diabetes Centre and collected after the five months of the data collection period. It was expected that after five months, the researcher would have collected enough data points to meet the minimum number of samples required for the study.

After collecting all the submitted envelopes, the researcher compiled all the data into a spreadsheet using the Statistical Package for the Social Sciences (SPSS) v. 22.0. SPSS was used to conduct the data analysis procedures discussed in Section 3.12.

#### **3.9.2 Phase 2—Quantitative Survey (Nurses)**

During the recruitment phase, nurses who were interested to participate in the study were given a survey package. In the survey package, an informed consent form was provided. The participants were asked to sign the informed consent form prior to responding to the DAS-3 study instrument. Participants were allowed to respond to the survey questionnaire at their own convenient time and location. Participants were asked to submit the survey package to a box located in the Nursing Department. Data collection continued for a period

of five months. It was expected that after five months, the researcher would have collected enough data points to meet the minimum number of samples required for the study. At the end of the data collection period, the researcher encoded the data in Excel and transferred all the data to SPSS.

### **3.9.3 Phase 3—Qualitative Interview (Nurses)**

For Phase 3 of the study, the researcher recruited participants by inviting nurses who completed the survey instrument for Phase 2 of this study to continue participating in Phase 3 of the study. Interested nurses were asked to tick the option for interview and provide contact details to the researcher to indicate their willingness to participate in Phase 3 of the study. The researcher contacted the nurses using the details provided in the survey in Phase 2 to schedule an appointment for an individual interview at the nurse's convenience. The initial plan was to recruit 10 interview participants but this was increased to 12 participants to reach data saturation. The interviews were held at a private office in the hospital, which was reserved by the researcher for this purpose.

On the day of the scheduled interview, the researcher opened the session by reviewing the policies and procedures identified in the informed consent form. The researcher reiterated that the interviews were audio recorded. After reviewing the informed consent form, the researcher asked the nurse to sign the form for the interview, including a waiver for the recording of the interview and the subsequent transcript. Once the informed consent form was signed, the researcher began the interview. After each interview, the researcher transcribed the recording and sent a copy of the transcript to the nurse for their review and approval. This step was undertaken to enhance the validity and reliability of the study results (Ali & Yusof, 2011). Once all the transcripts had been approved, the researcher began the qualitative data analysis procedures.

## **3.10 Quantitative Data Analysis**

### **3.10.1 Phase 1—Quantitative Survey (Patients)**

The data for Phase 1 of the study were collected using the DKT and the SDSCA-Arabic. Participants had the option to complete either or both questionnaires. The first instrument

measured the current level of diabetes knowledge among patients diagnosed with T2D, and the second instrument assessed what self-management activities they currently practice.

#### *3.10.1.1 Demographic Data*

Demographic data collected from the patients included their HbA1c level, age group, gender, monthly income, smoking habits, time since diagnosis, education level and diseases other than diabetes. These were collected through the DKT or the SDSCA survey tools as both have items to collect patients' demographic data. HbA1C was self-reported where patients were asked to report their latest HbA1c.

#### *3.10.1.2 Diabetes Knowledge*

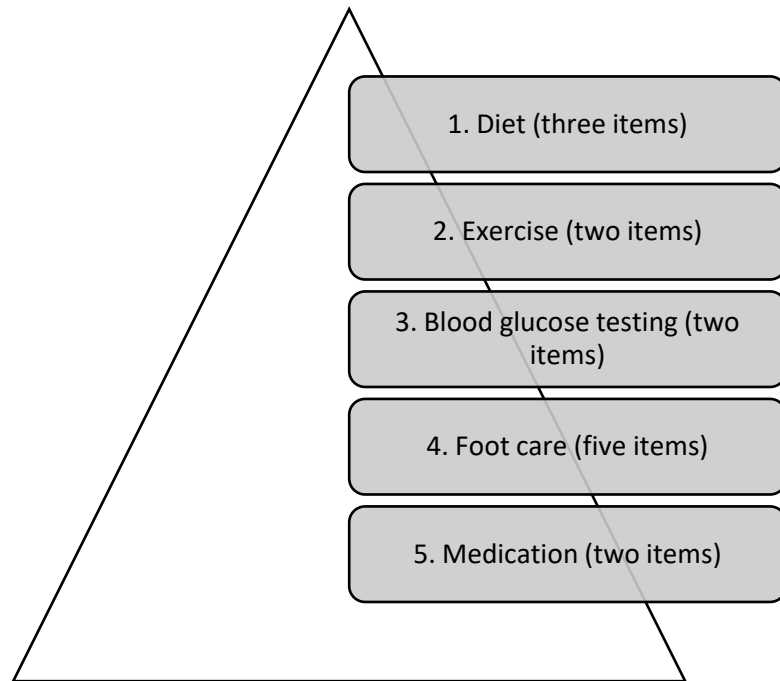
Data regarding diabetes knowledge was assessed through the DKT. The DKT is a 23-item instrument designed to assess patients' knowledge of diabetes, especially with regard to diet, exercise, blood glucose levels and testing, and self-care activities (Al-Maskari et al., 2013). The first 14 items are applicable to all patients with diabetes, while the last 9 items are applicable only for those people who are on insulin. Scores for the DKT can range from 0 to 14, based on the number of items the participants are able to answer correctly. The DKT was selected because it provides an effective, efficient and inexpensive way to assess a patient's current level of knowledge on diabetes (Sweileh et al., 2014).

#### *3.10.1.3 Self-management Activities Practised by Patients*

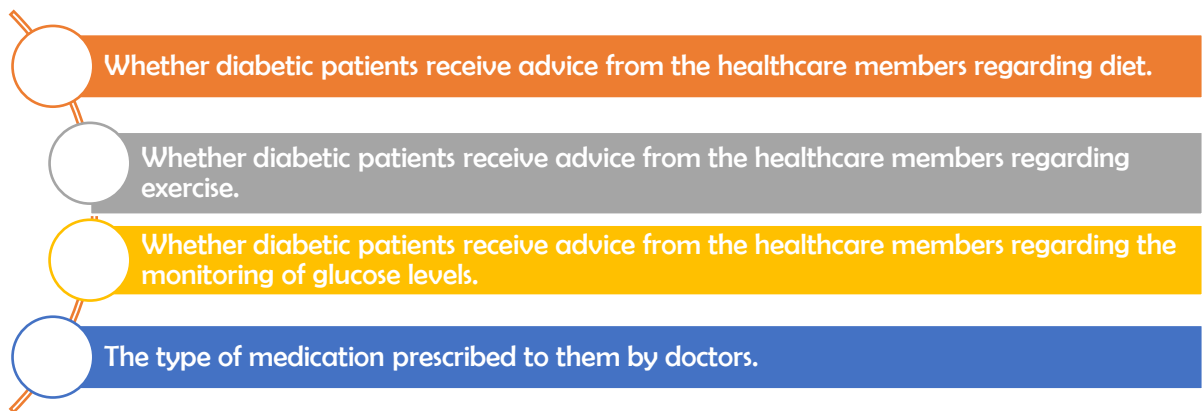
Data regarding self-management activities were collected through the SDSCA-Arabic and the extended SDSCA. The SDSCA consists of 14 items related to self-care activities that measure patients' behaviour concerning the self-management of T2D. Each item asks about the number of days (0–7) on which the patient performed a certain activity (related to diabetes care) within the last week. The 14 items were divided into five domains as shown in Figure 3.1.

The SDSCA extended survey investigates four main aspects (domains) as shown in Figure 3.2. Each of the first three domains (diet, exercise, glucose monitoring) include a number of items (advice) and participants were asked whether this advice was provided to them

through their healthcare practitioners or not. The proportion of participants that chose each item was calculated. Regarding the medications domain, participants were asked whether they were prescribed insulin or oral antidiabetics.



**Figure 3.1: The five Summary of Diabetes Self-Care Activities domains**



**Figure 3.2: The extended Summary of Diabetes Self-Care Activities domains**



#### *3.10.1.4 Descriptive Statistics for Demographic Data*

Demographic data collected were categorised as follows: gender (male/female); smoking status (Yes/No); monthly income (<SAR5,000, SAR5,001–10,000, SAR10,001–15,000 and >SAR15,001); time since diagnosis (<2 years, 2–4 years, 5–7 years, 8–10 years and >10 years); age group (18–30, 31–45, 46–55, >56 years); and HbA1c. Patients were classified according to self-reported HbA1c into three categories as recommended by the American Diabetes Association's guidelines (Al-Maskari et al., 2013): good control (HbA1c < 7%); acceptable control (HbA1c 7–8%); poor control (HbA1c > 8%). Education level (elementary, middle or high school, bachelor degree and postgraduate) was recorded, as were diseases other than diabetes (cardiac, hypertension, kidney or eye diseases; none; more than one disease). These demographic characteristics were expressed as counts and percentages. This was a common approach to describe categorical variables.

#### *3.10.1.5 Descriptive Statistics for DKT Scores*

After answering each of the 14 questions, a total score was calculated for each patient, which ranged from 0 to 14. Due to the large number of participants that were included in the study and the large number of questions, the scores were treated as continuous variables. Several measures were used to describe the test results:

- Overall knowledge was described using measures of central tendency such as mean, standard deviation and range values.
- The number (percentage) of patients that responded correctly to each question was calculated to determine the exact areas where knowledge is missing in diabetic patients.
- The proportion (percentage) of patients that passed the test was calculated: a score of  $\geq 7$  meant success.
- Participants were divided into three categories according to their knowledge regarding diabetes as defined by Al-Adsani et al. (2009):
  - a score of 1–6 indicated poor knowledge
  - a score of 7–8 indicated an acceptable level of knowledge
  - a score of 9–13 indicated a good level of knowledge.

The proportion (percentage) was calculated for each group.

#### *3.10.1.6 Descriptive Statistics for the SDSCA*

The SDSCA (as mentioned above) consists of five main domains. For each domain, a number of questions are asked to assess whether patients adhere to a certain activity or not. For each question (activity), the patient is asked to state the number of days they practiced that activity within the past week. For each domain, the patient's score was calculated by summing the scores for each of the questions in this domain and dividing by the number of non-missing items: for example, a patient's score for domain 1 =  $\sum(Q1 + Q2 + Q3 + Q4)/\text{number of non-missing questions}$ . The average score for each domain was calculated by summing the scores of all patients for that domain and dividing by the number of patients:

$$\text{Mean score} = \sum \text{score}/n$$

where  $n$  is the number of patients and score is a patient's score for that domain. The mean score was used to describe the overall adherence of patients to that domain of activities. Spider charts were also constructed to provide an overall visualisation of the mean scores in all domains.

#### *3.10.1.7 Descriptive Statistics for the Extended SDSCA*

The SDSCA extended survey investigates four main aspects (domains) similar to those in the SDSCA. However, each domain consists of a number of check boxes. The patient can choose more than one choice within each domain. Therefore, the best approach for descriptive purposes was to calculate the count/percentage of individuals that chose each answer with respect to the total number of patients. Based on the results of these descriptive statistical tests, the researcher drew conclusions regarding the current level of diabetes knowledge and self-management behaviours of the study participants.

#### *3.10.1.8 Inferential Statistics*

The goal of inferential statistics was to assess whether there was an association between the various demographic characteristics of diabetic patients and their DKT test scores. The

outcome of interest (dependant variable) was the DKT test score. As previously mentioned, this was treated as a continuous variable as the number of patients included was relatively high. The independent variables were gender, age category, education and smoking, which are categorical variables. Some variables had only two groups (e.g. gender) while others had more than two groups.

Data analysis was performed as follows:

1. The DKT score is a normally distributed variable due to the large number of participants included in the current study, which made parametric tests reasonable to use. A significance level of 0.05 was used throughout the analysis process. A  $p$  value  $<0.05$  was considered statistically significant.
2. If ANOVA was used (i.e. when the independent variable had more than two groups) and  $p$  values were found to be significant, post-hoc t-tests with Bonferroni correction were used for pairwise comparison to assess which pairs were significantly different from each other.

#### *3.10.1.9 Hypotheses*

The following hypotheses were tested:

Null hypothesis ( $H_0$ ): There is no significant difference in the distribution of DKT scores across various categories of the independent variable ( $\mu_1 = \mu_2 = \mu_k$ , where  $k$  is the number of groups in the categorical variable).

Alternative hypothesis ( $H_1$ ): There is a significant difference in the distribution of DKT scores across various categories of the independent variable ( $\mu_1 \neq \mu_2 = \mu_k$ , where  $k$  is the number of groups in the categorical variable).

#### **3.10.2 Phase 2—Quantitative Survey (Nurses)**

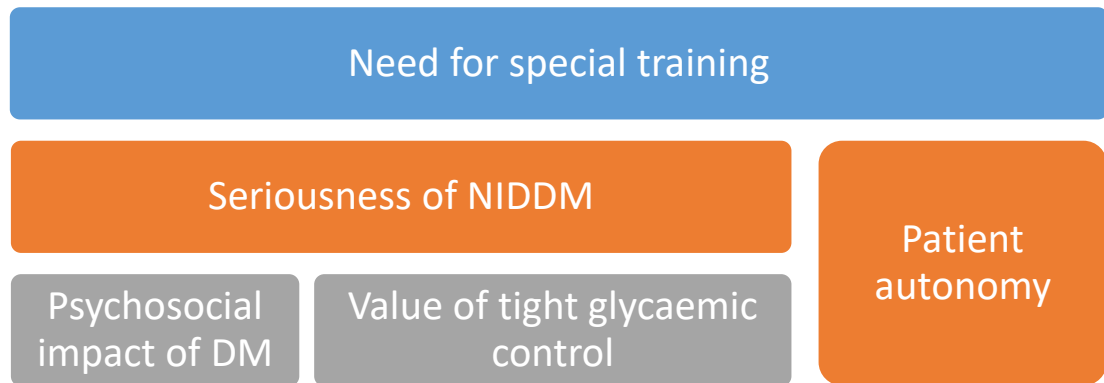
Phase 2 of the study focussed on the first research question, which asks about the perceptions of nurses in KSA about T2D and the self-management of T2D. To address this question, the researcher used data collected using the DAS-3, a quantitative survey instrument designed to evaluate knowledge, attitudes and practices to manage T2D.

### 3.10.2.1 Demographic Data

The first part of the instrument collects demographic data from the nurses, particularly their age range, gender, nationality, years of experience and whether they have had diabetes training or diabetes certification.

### 3.10.2.2 Attitude Regarding Diabetes

The perception, attitude and awareness of nurses regarding diabetes were investigated through the DAS-3. The DAS-3 can be administered to both patients and healthcare professionals to assess general attitudes towards diabetes. The DAS-3 consists of five domains (see Figure 3.4) that pertain to the perception of diabetes and its management.



**Figure 3.4: Diabetes Attitude Scale-3 domains**

Nurses were asked to indicate their level of agreement with the 33 statements in the instrument based on a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

## 3.11 Data Analysis

Only descriptive statistics were performed in Phase 2. Demographic data were expressed as counts/percentage due to their categorical nature. For the DAS-3 results, average scores were calculated for each of the domains (see Figure 3.5) by summing the scores for all questions that pertain to that domain and dividing that score by the total number of non-missing responses. For example, the need for special training domain is calculated by

summing scores for all participants for questions 1, 6, 10, 17 and 20 and dividing the sum by the total number of non-missing responses for this domain.

Means and standard deviations were used to express the results. Standard deviations were used to describe the variation in the responses. These two measures were used here as summing the responses makes the data continuous rather than ordinal in nature, which makes parametric measures of central tendency, such as the mean, appropriate for use in describing the results.

Scale Name	Scale Equation
Need for Special Training	$\sum (Q1, Q6, Q10, Q17, Q20) / \text{Number of non-missing items}$
Seriousness of NIDDM	$\sum (Q2, Q7, Q11, Q15, Q21, Q25, Q31) / \text{Number of non-missing items}$
Value of Tight Control	$\sum (Q3, Q8, Q12, Q16, Q23, Q26, Q28) / \text{Number of non-missing items}$
Psychosocial Impact of DM	$\sum (Q4, Q13, Q18, Q22, Q29, Q33) / \text{Number of non-missing items}$
Patient Autonomy	$\sum (Q5, Q9, Q14, Q19, Q24, Q27, Q30, Q32) / \text{Number of non-missing items}$

**Figure 3.5: Diabetes Attitude Scale–3 formulae**

### 3.12 Qualitative Data Analysis

Data analysis for Phase 3 of this study utilised data collected through the individual interviews with 13 nurses and clinical educators. The results of the qualitative data analysis were used to address the fourth research question of the study, which was formulated to investigate the perceptions of nurses and clinical educators regarding the challenges of providing education support on T2D self-management to patients. The collected qualitative data were transcribed and coded, and then segregated into meaningful units. The researcher also identified patterns within the data and synthesised these findings to address the fourth research question.

Content analysis allows for the subjective interpretation of text to help researchers identify recurring codes and collapse them into broader themes and patterns (Hsieh & Shannon, 2005). It is one of the most widely used analytical tools due to its flexibility in identifying

codes deductively (top-down, theory driven) or inductively (bottom-up, data driven), depending on the topic and the nature of the interviews (Hsieh & Shannon, 2005; Leech & Onwuegbuzie, 2011; Thomas, 2006; Willig, 2008). Given that this is an understudied topic in KSA, it was important to avoid utilising an a priori set of assumptions or models prior to conducting the interviews, which the more deductive methods call for (Thomas, 2006). Therefore, using a more inductive approach placed the participant, rather than the researcher, as the expert and this allowed for a more accurate, bottom-up interpretation of the codes and emerging themes in the interviews.

The specific procedures used were in accordance with Thomas's (2006) guidelines. First, the raw data were prepared in text form and all transcripts were formatted consistently (data cleaning). Then, each transcript was read several times to ensure familiarity with the data and highlight recurring codes and emerging themes in the text. Both general (or meta) categories (based on the research questions), and more specific categories were created (in vivo coding, based on the raw data). These specific categories differed as little as possible from the participants' own words; given the large amount of data, NVivo was used here to aid in this analytical process. Next, overlapping codes were assessed to ensure that they could be categorised under similar themes, and uncoded texts were evaluated to ensure that they were not relevant to the research questions. Finally, the category system was revised and refined; subtopics were generated when necessary, common themes were collapsed into broader, superordinate categories and appropriate quotes were selected to support these categories. This inductive approach led to a richer and more participant-driven analysis that shed light on the principles and practices that can reduce the barriers to providing self-management education to T2D patients in KSA.

### **3.12.1 Rigour**

In quantitative studies, the emphasis on rigour is manifested in the reliability and validity of the study. However, in qualitative studies, rigour pertains to credibility, confirmability and transferability (Houghton, Casey, Shaw & Murphy, 2013). These three aspects of rigour are discussed in further detail in the following subsections. This includes the steps taken by the researcher to ensure that the study was conducted to uphold qualitative rigour.

#### *3.12.1.1 Credibility*

In qualitative studies, maintaining credibility pertains to ensuring that descriptions of the topic under investigation are based on the participants' viewpoints (Hunt, 2011). To uphold the credibility of the study results, the researcher included transcript reviews and member checking to ensure that the findings of this study accurately represent the views of the participants. Transcript reviews were conducted prior to data analysis, while member checking was conducted after data analysis. In both instances, participants were given the opportunity to make corrections. Conducting this step ensured that the findings of the study accurately reflect the views and perspectives of the participants on the topic under investigation (Ali & Yusof, 2011).

#### *3.12.1.2 Confirmability*

Concerns with confirmability in qualitative studies pertain to maintaining this study objectivity and avoiding bias in all phases of the study, from data collection to data analysis (Chenail, 2011). To maintain objectivity, the bracketing was implemented throughout the entire process. Bracketing involves practising reflexivity and identifying the views of the researcher that could affect the process of conducting the study, and in turn, the study findings (Chan, Fung & Chien, 2013). These views were identified in a reflexive diary containing the researcher's pre-existing ideas about the subject under investigation. The researcher also took care to maintain a neutral demeanour during the interviews and avoid giving verbal or non-verbal affirmation or objection to the views expressed by the participants. Finally, data triangulation was conducted to enhance the confirmability of the study findings (Barratt, Choi & Li, 2011). The process for data triangulation is discussed in further detail in Section 3.14.1.4.

#### *3.12.1.3 Transferability*

The last concern regarding qualitative rigour pertains to transferability, or the generalisability of study findings to other settings or contexts (Thomas & Magilvy, 2011). Concerns with transferability were addressed by providing a thorough description of the study setting. This included the assumptions on which the study was based and the scope

and limitations of the study (Sinkovics & Alfoldi, 2012). In providing this information, the aim was to allow future researchers to determine whether the findings of the study were applicable in other settings or contexts (Morse, 2015).

#### *3.12.1.4 Triangulation*

Triangulation is defined as ‘combining multiple theories, methods, observers and empirical material to product a more accurate, comprehensive, and objective representation of the object of study’ (Silverman, 2011, p. 329). Based on this definition, triangulation can be applied by using multiple methods to investigate the same topic—in this case, quantitative and qualitative methodologies. In addition, perspectives were solicited from both patients and nurses. In doing so, points of convergence were identified within the data to support the study findings and enhance the overall validity and reliability of the results (Guion, Diehl & McDonald, 2011).

### **3.13 Ethical Considerations**

The project was approved by both the RMIT University Human Research Ethics Committee (Appendix F) and the MOH in KSA (Appendix G). The researcher took care to ensure that the study was conducted in accordance with the standards for ethical academic research. This involved obtaining informed consent for all phases of the study. Study participants were also provided with complete information regarding the study to allow them to make an informed decision on whether to participate. The policies designed to protect participant privacy and data confidentiality were also clearly stated on the informed consent form. These procedures were:

1. Participation in the study was strictly on a voluntary basis.
2. The nature of participation and time commitment required was clearly articulated in all recruitment materials.
3. The researcher provided his contact details for potential participants who may have any questions about the study.
4. No identifying information was collected for the study.



5. No names were used in the study or in the final report. Participants in the interviews were referred to as 'Nurse # X'.
6. All electronic data for the study were stored in password-protected files. All paper forms were stored in a locked filing cabinet. Only the researcher had access to files for the study.

### **3.14 Theoretical Framework**

The theoretical framework guiding this study was Dorothea Orem's theory of self-care deficit. This theoretical framework highlights the importance of self-care and aims to measure people's health, wellbeing, improvement and healthy functioning (Renpenning & Taylor, 2003). The theory is described by two main features: self-care and self-care deficit. Self-care demonstrates how and why people care for themselves, whereas self-care deficit reveals how and why nurses can help people. Hence, Orem's theory is used in this study to determine whether patients with diabetes can look after their own health.

### **3.15 Chapter Summary**

The purpose of this mixed methods study was to explore the current situation of self-management education support for patients with T2D in KSA. To achieve this purpose, the researcher collected quantitative data from patients regarding their current level of knowledge on diabetes and their current self-management behaviours; quantitative data from nurses on their attitudes and perceptions towards diabetes and self-management of this condition; and qualitative data through individual interviews with nurses on their perceptions regarding the challenges of providing education support for T2D patients in KSA. The quantitative data were analysed using descriptive and inferential analysis, while the qualitative data were analysed to generate themes to represent the perceptions of nurses. The following chapter presents the results of the analysis procedures described in this chapter.

## **Chapter 4: Psychometric Evaluation of the Revised Michigan Diabetes Knowledge Test (V.2016) in Arabic: Translation and Validation**

### **4.1 Introduction**

DM, as defined by the WHO (2016), is ‘a metabolic disorder of multiple aetiology characterised by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both’. The IDF has indicated that there are 415 million people with diabetes in the world and this number is expected to rise to 642 million by 2040. Conversely, only 12% of global health expenditure, estimated at US\$673 billion, is directed towards diabetes (IDF, 2016).

KSA, according to data released by IDF, is one of the top five countries for the prevalence of diabetes in the MENA region, with 3.8 million diabetics, which represents 23.9% of the population. This may be due to cultural structures, active socioeconomic growth and significant recent changes in lifestyle (Alhawaish, 2013; IDF, 2016). Studies have revealed that diabetes cost KSA an estimated US\$9.4 billion in 2010, a figure that has been predicted to increase sevenfold to US\$6.5 billion by 2020 (Alhawaish, 2013).

DSME is a critical approach that provides the foundation to assist people with diabetes to make a multitude of conventional self-management arrangements and to perform multiple care activities. The primary intention of DSME is to encourage active self-care behaviour facilitating the knowledge, skill and ability required for diabetes self-care. Further, studies have reported that the utilisation of healthcare services and facilities decreases when people receive educational support compared with those who do not. DSME helps control HbA1c levels, which likewise results in significant healthcare savings (Davis, 2010).

The estimation of diabetic patient levels of knowledge has been the cornerstone of medical assessment for many years. In 1998, the DKT was validated and introduced as a reliable instrument for the expert evaluation of patients’ general knowledge of diabetes (Fitzgerald et al., 2016). Since then, the test has been used by diabetes researchers throughout the

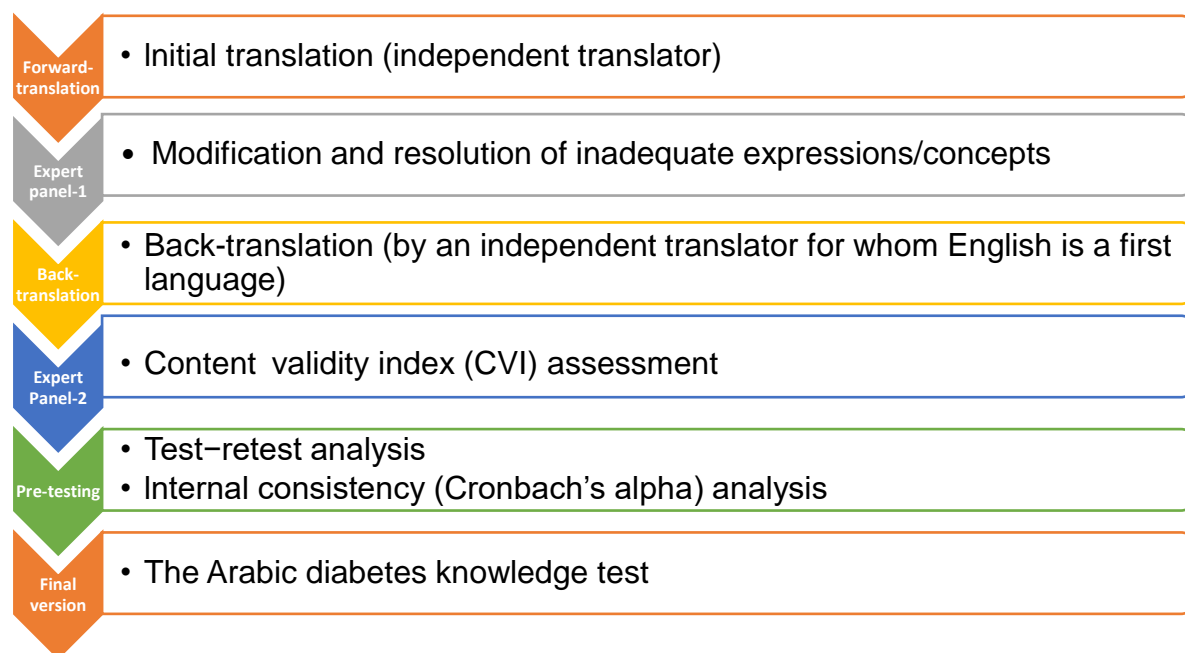
world and translated into multiple languages including Spanish, Greek, Navajo, Norwegian, Arabic and Malaysian (Al-Qazaz, Hassali, Shafie, Sulaiman & Sundram, 2010).

A 2011 review of the 1998 version of the DKT showed that the test was outdated and needed to be updated according to evidence provided by more current literature (Fitzgerald et al., 2016). The DKT has since been revised and modified based on current self-management education and practice standards, and was renamed DKT-2 in 2016. No items were added or withdrawn from the DKT-2 for use in this study, and most modifications were minor. Seven items were adjusted to simplify the questions and answers; two items were modified to improve the grammar; and the last four items were changed to meet current national standards (Fitzgerald et al., 2016).

The aim of the current study was to translate a valid version of the DKT-2 into Arabic and to evaluate the psychometric properties of this new Arabic version.

## **4.2 Methods**

Translation of the DKT-2 was conducted in accordance with the WHO process for the translation and adaptation of instruments (WHO, 2015). Professional translation and validation of texts was attained via several distinct steps, as shown in Figure 4.1: forward- and back-translation, expert panel review, pre-testing, cognitive interviewing and psychometric evaluation.



**Figure 4.1: Flowchart depicting the processes used for the translation and validation of the instrument**

#### **4.2.1 Study Setting and Sampling Procedures**

This study was conducted in the SDEC in KFMC, which is one of the largest healthcare facilities in the Gulf Region with a total capacity of 1,059 beds. The centre consists of four hospitals and multiple departments providing tertiary care for all patients across KSA.

A convenience sample of 139 participants was identified between September and October 2015. Participants were required to meet the following inclusion criteria at the time of the study to be considered: (1) a patient at KFMC, (2) at least 20 years old, (3) diagnosed with T2D and (4) able to read and write in Arabic or English.

#### **4.2.2 Procedure**

After providing informed consent, the recruited participants were asked to complete a questionnaire. Their HbA1c levels were obtained from medical records with their permission. A researcher was available to answer any questions arising from the questionnaire. To determine test-retest reliability, participants were informed that there

would be a follow-up appointment in two weeks' time. In total, 34 participants completed the questionnaire twice.

**Table 4.1: Expert panel characteristics**

ID	Gender	Profession	Work in healthcare	Diabetes experience (years)
1	F	Head nurse	Yes	3
2	F	Staff nurse	Yes	8
3	F	Head of Diabetes Education	Yes	6
4	M	Nurse manager	Yes	14
5	M	Staff nurse 1	Yes	10
6	F	Nursing student	No	0
7	M	Clinical research consultant	Yes	22
8	F	Nurse	Yes	1.5
9	M	Translator	Yes	0

### 4.3 Ethics Approvals

This study received ethics approval from the ethics committee at KFMC in KSA (approval H-01-R-012), Institutional Review Board with Office for Human Research Protections / National Institutes of Health, USA (IRB00008644) and RMIT University in Melbourne (ASEHAPP 59–14).

### 4.4 Process of Translation and Validation

#### 4.4.1 Forward-translation

In the first stage, the DKT-2 was translated into Arabic for a fee by a professional independent translator (Appendix H). The translator was requested to retain the concepts, to use appropriate language to reach the broadest possible audience and to comply with the WHO general guidelines (WHO, 2015). The assignment was completed over five days and, with the return of the forward-translation, the first Arabic version was ready.

#### **4.4.2 Expert Panel 1**

The researcher organised a panel group consisting of five members including the original translator, experts in health and experts experienced in research instrument adoption, according to the WHO (2015) recommendations. The panel reviewed all related materials provided by the principal investigator along with the translation, and were requested to identify and modify any inadequate expressions or concepts. Their recommendations were adopted for the DKT-2, including the phrases utilised in items one, two, three, four and eight for non-US-patient populations.

The expert panel discussed the individual words and expressions comprising each item and suggested alternatives. Each of the recommendations made by the panel members was considered, except for those that the majority of the panel were able to clearly justify dismissing. At the completion of this stage, the translated text was ready for back-translation.

#### **4.4.3 Back-translation**

The DKT-2 was sent to a second independent, and this time native-English-speaking, translator who had not yet engaged in the process and who had no prior knowledge of the study, for back-translation into English. The job was completed and sent back to the researcher three days later. The back-translated version was remarkably similar to the original text with the exception of the sections recommended for non-US-patient populations.

#### **4.4.4 Expert Panel 2**

For the second round of revision and modification, the researcher invited another bilingual panel group to assess content validity via the Content Validity Index (CVI) and to prepare the final version of the Arabic DKT-2. As shown in Table 4.1, committee members of both genders were recruited, with the majority of these experts being nurses; however, the sample also included a clinical educator, a clinical research consultant, the head of Diabetes Education and a translator. All worked at KFMC in Riyadh.

Content validity has been defined as ‘the degree to which an instrument has an appropriate sample of items for the construct being measured’ (Denise & Polit, 2004). CVI is the most broadly utilised index in content assessment. It consists of two characters: the item-level index (I-CVI) defining the content validity of individual items; and the scale-level index (S-CVI) determining the content validity of an overall scale (Fitzgerald et al., 1998). Researchers consider that an acceptable content validity has an I-CVI of  $\geq 0.78$  and proportionate unanimous approval or S-CVI/universal agreement (S-CVI/UA) of 0.8, 0.9 or greater (Denise & Polit, 2006).

Studies recommend that a minimum of three experts should engage in this task and that a four-point scale should be employed to rate the items, where 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant and 4 = highly relevant (Fitzgerald et al., 1998). The purpose of using CVI here was to determine the cultural appropriateness and effectiveness of the DKT-2 Arabic version in measuring patients’ level of knowledge in the Arabic-speaking population.

#### **4.5 Statistical Analysis**

All statistical calculations were undertaken using the SPSS v. 23 software. Descriptive statistics were used to describe participant characteristics. Test–retest reliability ( $n = 34$ ) was determined by the intraclass correlation coefficient (ICC) using a two-way, random form. An ICC of 0.75 is considered an excellent level of test–retest reliability, scores of 0.40–0.75 reflect a good level of reliability and  $<0.4$  indicates poor test–retest reliability (Moljord et al., 2015). Cronbach’s alpha was used to evaluate the test’s internal consistency; an acceptable Cronbach’s alpha for internal consistency is  $\geq 0.70$  (DeVon et al., 2007).

**Table 4.2: Participant demographics**

Characteristics		<i>n</i>	%
HbA1c level	Good control	28	20.1
	Acceptable control	39	28.1
	Poor control	71	51.1
	Missing	1	0.7
Age group	18–30 years	56	40.3
	3–45 years	34	24.5
	46–55 years	20	14.4
	>56 years	25	18
	Missing	4	2.9
Gender	Male	62	44.6
	Female	74	53.2
Missing		3	2.2
Monthly income	<SAR5.000	56	40.3
	<SAR10.000	44	31.7
	<SAR15.000	14	10.1
	>SAR16.000	19	13.7
	Missing	6	4.3
Smoking	Currently	16	11.5
	No	95	68.3
	Yes	14	10.1
	Missing	14	10.1
Diagnosed time	<2 years	7	5.0
	2–4 years	18	12.9
	5–7 years	27	19.4
	8–10 years	21	15.1
	>10 years	61	43.9
	Missing	5	3.6
Education level	Elementary school	16	11.5
	Middle school	14	10.1
	High school	45	32.4



Characteristics		<i>n</i>	%
	Bachelor	57	41.0
	Postgraduate	4	2.9
	Missing	3	2.2
Other diseases	Cardiac	7	5.0
	Blood pressure	13	9.4
	Kidney	3	2.0
	Eye	20	14.4
	>1	53	38.1
Missing		43	30.9

## 4.6 Results

### 4.6.1 Participant Characteristics

In total, 139 patients participated in the first round but only 34 (or 24%) were admitted to the second round. Demographic data reflected HbA1c level, age, gender, monthly income, level of education, time since T2D diagnoses and number of diseases contracted. As shown in Table 4.2, 51% ( $n = 71$ ) of participants indicated poor levels of HbA1c level control, 40.3% ( $n = 56$ ) were 18–30 years of age, 44.6% ( $n = 62$ ) were male and 53.2% ( $n = 74$ ) were female, 40.3% ( $n = 56$ ) received less than SAR\$5,000 per month, 41% ( $n = 57$ ) held a bachelor degree, 44% ( $n = 61$ ) had been diagnosed with T2D for more than 10 years and 38% ( $n = 53$ ) had more than one disease.

### 4.6.2 Reliability and Validity of the Arabic DKT-2

The Arabic DKT-2 received an internal consistency score of 0.75, which is within the recommended range for Cronbach's alpha (Al-Qazaz et al., 2010). The outcomes of the test–retest analysis (see Table 4.3) revealed excellent instrument reliability with a mean ICC of 0.90 (Moljord et al., 2015). The content validity analysis presented in Table 4.4 shows the I-CVI for all instrument scales was 0.83–1 and mean S-CVI was 96, indicating

strong agreement between the two versions. According to Lynn (1986), the I-CVI should be no lower than 0.78 for the S-CVI to be judged acceptable.

## **4.7 Discussion and Conclusion**

This study sought to evaluate the translation of the DKT-2, the most commonly used instrument for determining knowledge of diabetes care and management, from English into Arabic (Al-Qazaz et al., 2010). The results demonstrated that the Arabic DKT-2 questionnaire is an acceptable cross-cultural research instrument for use in KSA as shown in Table 4.4. It was lengthy process to translate this text into another language taking into consideration cultural differences (Guillemin, Bombardier & Beaton, 1993; Wild et al., 2005). The translation and validation process followed the recommendations of WHO for the translation and adaptation of instruments (WHO, 2015), and included forward-translation conducted by an independent translator followed by a systematic panel meeting to discuss the translation's quality and modify the instrument in keeping with WHO's guidelines. The next step required another independent translator to perform a back-translation before a third version of the Arabic DKT-2 was produced; finally, a second panel met to discuss the CVI and translation outcomes. This panel reported that the I-CVI for all instruments was between 0.83 and 1, with a mean S-CVI of 96, indicating excellent agreement according with Lynn (1986). Statistical psychometric analyses determined that the DKT-2 received an acceptable result of 0.75 for its internal consistency (Cronbach's alpha test) as well as an excellent reliability ICC level of 0.90.

**Table 4.3: Intraclass correlation coefficient (ICC)**

	ICC <sup>a</sup>	95% confidence interval		F-test with true value 0			
		Lower-bound	Upper-bound	Value	df1	df2	Sign
Single measures	0.822 <sup>b</sup>	0.573	0.920	13.418	33	33	0.000
Average measures	0.903 <sup>c</sup>	0.729	0.958	13.418	33	33	0.000

*Note.* Two-way mixed-effects model where people effects are random and measures effects are fixed; <sup>a</sup>type A ICCs using an absolute agreement definition; <sup>b</sup>the estimator is the same whether the interaction effect is present or not; <sup>c</sup>to achieve an estimate, this number is computed assuming the interaction effect is absent.

**Table 4.4: Content Validity Index (CVI)**

Item description	Expert						Number in agreement	I-CVI
	1	2	3	4	5	6		
Scale item 1	3	3	4	3	4	4	6	1
Scale item 2	3	3	3	4	3	4	6	1
Scale item 3	4	3	4	3	3	3	6	1
Scale item 4	3	3	3	4	3	2	5	0.833
Scale item 5	4	3	2	4	4	4	5	0.833
Scale item 6	4	4	3	3	4	4	6	1
Scale item 7	4	3	4	3	4	4	6	1
Scale item 8	4	4	4	4	4	3	6	1
Scale item 9	3	4	3	3	2	3	5	0.833
Scale item 10	3	4	3	3	4	4	6	1
Scale item 11	4	3	4	3	4	3	6	1
Scale item 12	3	3	3	4	3	4	6	1
Scale item 13	3	4	3	3	4	3	6	1
Scale item 14	4	4	4	3	4	4	6	1
<b>S-CVI/Ave</b>								<b>0.964</b>
<b>Total agreement</b>								<b>11</b>
<b>S-CVI/UA</b>								<b>0.785</b>

The original instrument was well developed, validated and widely used to assess general diabetes knowledge. It is a simple and user-friendly instrument that has been translated into many languages (Fitzgerald et al., 1998). It has consistently achieved acceptable results in Cronbach's alpha validity tests (Al-Qazaz et al., 2010). Further, the results of this study are consistent with Aljohani et al. (2016), who used similar methods for the translation and validation of the SDSCA survey into Arabic (Aljohani et al., 2016).

In conclusion, this Arabic version of DKT-2 has been demonstrated to be a reliable and valid measure of diabetes knowledge that can be used in clinical practice. However, the sample sizes used by this study for testing–retesting, as well as the convenience sampling methods, may not be representative of all situations in KSA.

#### **4.8 Chapter summary**

The Objective of this chapter is to translate the revised Michigan Diabetes Knowledge Test into the Arabic language and examine its psychometric properties. Of the 139 participants recruited through King Fahad Medical City in Riyadh, Saudi Arabia, 34 agreed to the second-round sample for retesting purposes. The translation process followed the World Health Organization's guidelines for the translation and adaptation of instruments. All translations were examined for their validity and reliability. The translation process revealed excellent results throughout all stages. The Arabic version received 0.75 for internal consistency via Cronbach's alpha test and excellent outcomes in terms of the test–retest reliability of the instrument with a mean 0.90 intraclass correlation coefficient. It also received positive content validity index scores. The item-level content validity index for all instrument scales fell between 0.83 and 1 with a mean scale-level index of 0.96. Finally, The Arabic version is proven to be a reliable and valid measure of patient's knowledge that is ready to use in clinical practices.

## **Chapter 5: Challenges of Providing Self-management Education Support to Patients With Type 2 Diabetes—A Qualitative Study**

### **5.1 Introduction**

This chapter presents the results of the qualitative component of this research (Phase 3). Thirteen open-ended and semi-structured interviews were conducted with a team of healthcare professionals and educators. These included nurses, clinical educators and dietitians employed by the Diabetes Centre at KFMC, KSA—and the Eastern Mediterranean and Middle East region at large—has some of the world's highest national prevalence rates of diabetes, reaching over 10.8% (Shaw, Sicree & Zimmet, 2010). Therefore, the purpose of these interviews was to understand the challenges that healthcare teams in KSA can face when providing self-management education and support to patients suffering from T2D.

Invitations, along with the research information sheet, were sent to all healthcare staff via internal email after obtaining permission from the Diabetes Centre's executive management team. The interviews were conducted between December 2015 and January 2016 at a local office within the KFMC Diabetes Centre. Given that the primary language in KSA is Arabic but many employees are English-speaking foreigners, participants were given the choice to be interviewed in either English or Arabic. Eight participants chose to be interviewed in English and five chose to be interviewed in Arabic. All interviews were transcribed verbatim by professional transcribers. The Arabic interviews were translated into English by a professional, bilingual transcriber and then validated by an independent translator and the participants themselves to ensure accuracy. All the data were managed and analysed using NVivo v. 11.

Content analysis allows for the subjective interpretation of text to help researchers identify recurring codes and collapse them into broader themes and patterns (Hsieh & Shannon, 2005). It is one of the most widely used analytical tools due to its flexibility in identifying codes deductively (top-down, theory driven) or inductively (bottom-up, data driven), depending on the topic and the nature of the interviews (Hsieh & Shannon, 2005; Leech &

Onwuegbuzie, 2011; Thomas, 2006; Willig, 2008). Given that this is an understudied topic in KSA, it was important to avoid utilising an a priori set of assumptions or models prior to conducting the interviews, which the more deductive methods call for (Thomas, 2006). Therefore, using a more inductive approach placed the participant, rather than the researcher, as the expert and this allowed for a more accurate, bottom-up interpretation of the codes and emerging themes in the interviews.

The specific procedures used were in accordance with Thomas's (2006) guidelines. First, the raw data were prepared in text form and all transcripts were formatted consistently (data cleaning). Then, each transcript was read several times to ensure familiarity with the data and highlight recurring codes and emerging themes in the text. Both general (or meta) categories (based on the research questions), and more specific categories were created (in vivo coding, based on the raw data). These specific categories differed as little as possible from the participants' own words; given the large amount of data, NVivo was used here to aid in this analytical process. Next, overlapping codes were assessed to ensure that they could be categorised under similar themes, and uncoded texts were evaluated to ensure that they were not relevant to the research questions. Finally, the category system was revised and refined; subtopics were generated when necessary, common themes were collapsed into broader, superordinate categories and appropriate quotes were selected to support these categories. This inductive approach led to a richer and more participant-driven analysis that shed light on the principles and practices that can reduce the barriers to providing self-management education to T2D patients in KSA. A word cloud (Figure 5.1) was generated to capture the most common words found in the interviews.



In the next section, an overview of the participants is provided. This is followed by a brief summary of the patient demographics with which participants most frequently interact. Then, the topic of self-management education support at the Diabetes Centre is discussed in light of their working hours as well as the roles and responsibilities of each HCP and educator. Participants then discussed some of the challenges they face while providing education and support to T2D patients, many of which revolved around women's needs, food habits, cultural differences and language barriers (particularly for those who do not speak Arabic). Finally, recommendations are provided that highlight some effective ways to deal with these challenges.

## 5.2 Overview of the Participants

To gather the participants' characteristics and better understand their perceptions, two questions were asked. First, they were asked to introduce themselves and provide a general overview of their nationality, education, employment experiences and roles and responsibilities in their current job. Second, they were asked to discuss how prepared and confident they felt while providing self-management education support to T2D patients. Several quotes are provided in the remainder of this chapter, in which participants' names have been replaced with pseudonyms to protect their privacy.

Thirteen members of a multidisciplinary team operating the Diabetes Centre took part in this interview. Eight of the participants were nurses, four worked as health educators and one worked as a dietician. Five of the participants were from KSA, two were from India and six were from the Philippines. The majority of participants had more than 11 years of employment experience, while three had less than 2 years of experience. With regard to experience working specifically with T2D patients, none of the participants had more than 12 years experiences; nine had less than 2 years; and four had 2–6 years of experience in this field.

All the participants in this study held a bachelor degree in their discipline (nursing, health education or clinical dietician) obtained from a local university in their country of origin. None of the participants had any postgraduate training. The degree of professional training varied between participants, depending on their availability and internal management criteria for each employee. Those who specialised in nursing had much more experience in their field than those from other disciplines; they also completed several training courses on supporting patients with T2D. For example, Sofia (a clinical educator) recounted that she attended a course at the National Centre for Diabetes: ‘it was compulsory ... This was the longest course I had completed since I joined KFMC ... I attended training on the insulin pump three times as well [and also learned] how to prepare and use the continuous glucose monitoring system’.

With regard to the health educators and dieticians, junior staff members had less than two years of experience, while their supervisor had six years of experience: ‘I [only] completed one course. It was for one month, [about] diabetes and nutrition’ (Maya, Clinical Educator [CE]). Many junior staff members had undergone some form of training during their internship period, while others attended a diabetes education course run by the National Centre for Diabetes. Given the lack of training experience for some of the junior staff, participants generally felt that they would like to further their personal and professional development and gain access to additional training courses. For instance, many participants felt that they would like to see more ‘insulin pump training’ and more education in endocrinology: ‘we do not have any deep information or knowledge [about] the insulin



pump ... [this] is one area in which we need more training' (Ashley, Registered Nurse (RN)).

Additionally, both Arabic and non-Arabic speakers felt that non-Arabic-speaking staff faced major language barriers while communicating with patients. For instance, Alyssa (RN) said, 'I need to educate myself more regarding the [Arabic] language by reading and listening to CDs'. Regardless of their perception that more education and training is warranted, all participants felt that 'it's very easy' to access professional training at the KFMC by following the routine internal administrative process: 'the only thing you need to do is to get someone to cover your work roster ... In regard to an *education vacation* [emphasis added], they are supportive as long as you follow the internal policy ... We get support' (Jasmine, RN).

Although all participants felt that adequate preparation before working with T2D patients increases the overall self-confidence and performance of employees, they also reflected on how the level of preparation varied among Diabetes Centre staff. This variability was owing to differences in whether they were trained directly at the Diabetes Centre during their internship or at their previous place of employment prior to joining KFMC. Jennifer (RN), for example, provided a rather honest response about the level of training she received at the KFMC: 'Let me tell you the truth ... I was *not* prepared well here in KFMC. I was *really* prepared at the King Abdulaziz University Hospital which [provided] me with a [quality] internship from A to Z'. Interestingly, despite some of the narratives that suggested that some participants were less prepared than others, 12 of the 13 reported feeling very confident. Maya (CE) said she felt '70% confident' in her ability to provide self-management education support to patients; however she also said:

I feel confident all the time ... I think all health professionals should be well prepared so that they are confident otherwise they will not make good progress with the patient ... Of course, confidence comes with experience, commitment, and hard work (Maya, CE).

### **5.3 Most Common Patient Demographics**

One of the goals of this research was to understand the most common patient demographic that the employees at the Diabetes Centre support. In the interviews, participants were asked to note patients' genders, ethnicity and age groups. Their responses indicated that the majority of the T2D patient population with which they interact come from an Arab background and also suffer from obesity; however, their perceptions regarding age and gender were mixed: 'Since we are in Saudi, the majority of our patients are Arabs and have T2D ... It usually affects females, and usually, the patients are obese' (Helen, RN). Similarly, Elizabeth (RN) said, 'most of the females are bigger than the males, from what I've observed'. Four participants recounted that most of their patients who had a diagnosis with T2D were also obese. Regarding gender, five of the participants stated that there were more female than male patients; one said he saw more males than females, and one said that the number of males and females seemed equal: 'Most of them are 14 years old and above, with Type 2 ... There isn't much difference in the number of males and females ... I think it's fifty-fifty' (Michelle, CE). With regard to age, four participants felt that the most common demographic was the elderly while one felt that she interacted with adults of all ages. Three felt there was no specific age demographic.

### **5.4 Self-management Education Support at the Diabetes Centre**

In the next section of the interview, participants were asked how they provide diabetes self-management education to their patients. They discussed how the Diabetes Centre comprises several divisions including nursing, health education, and nutrition, in addition to physicians' clinics. All healthcare professionals and allied health professionals are obligated to provide self-management health education to their patients. Given the importance of providing health education, the KFMC created a separate department, the Health Education Clinic, to oversee all educational programs at the Diabetes Centre. This clinic ensures that employees meet the Diabetes Centre's professional standards of providing health education to patients. This clinic operates from Sunday to Thursday, from 8 a.m. to 4 p.m. On Sundays, it is open for patients with an insulin pump; on Mondays and Tuesdays, it is open for follow-up care; Wednesdays are dedicated to patients with a

continuous glucose monitoring system device; and on Thursdays, the centre accepts appointments for all patients. All patients are first required to see a physician for their initial consultation. They are then transferred by their physician to the Health Education Clinic, which in turn follows up with the patient, according to their needs.

Health Education Clinic staff members provide educational sessions for their patients according to need, and discuss topics related to self-management. These topics include diet, exercise, lifestyle, medication management, as well as the diabetes devices they use. As part of their education, health educators ensure patients fully understand how to use the devices given to them by practising their use with the patients to ensure patient safety and to avoid any potential harm. Sofia (CE), for example, provided a thorough description of her role as a health educator:

Our job is to teach them how to protect themselves against diabetes and its complications ... We tell them about the different kinds of medication available here in Saudi Arabia that they might need to take ... If they need to have insulin, we tell them how to use it ... In regard to lifestyle, we also teach them how to follow a healthy lifestyle—not to restrict them, but to tell them what they should avoid, and the alternatives ... How exercise makes a big improvement to their progress and a little daily effort will help them to control their disease ... [We also teach them] how to check their blood glucose level and what is the normal range before and after eating ... For patients with an insulin pump, we teach them how to use it and they get face-to-face training for two weeks here in our room ... [we teach them] how to adjust their dose in the month of Ramadan [the holy month for Muslims]—not from a religious perspective, [but a health one] (Maya, CE).

In addition to face-to-face care, the centre also provides a wide array of educational materials to patients, including pamphlets, booklets, brochures and diabetes educational films. All these educational materials are available either at the clinic or via the official website in the Health Education section. The education films are usually screened at the hospital; these also include films on any awareness campaigns organised by the Diabetes Centre. The health education team is also working on a new project that supports peer learning strategies and follows the same concept as the ‘halfway-house initiative’; as

indicated by the team leader: ‘we are working on something new ... There will be online group therapy sessions, and patients with a particular disease can join the group, which is under the direct supervision of the health education team’ (Sofia, CE). She was enthusiastic about the program as patients would be able to ‘speak to each other, and discuss their daily needs, and *learn* from each other’. She said the goal of the program was to begin by providing educational resources and support systems to T2D as well as cancer patients, before possibly reaching out to other patient demographics. The implementation of this project, however, is conditional on the release of appropriate budgets by the government of KSA.

**Table 5.1: Responses to challenges to providing self-management education support to Type 2 diabetes patients**

Themes	Subthemes	Response theme
Cultural challenges	Misconceptions	Lack of knowledge Over-reliance on traditional herbs without medical consultation
	Sedentary lifestyle	Social occasions and parties Lifestyle modification
	Women’s needs	Women’s companions and transportation Lack of gyms designated for women
	Food habits	<i>Kabsa</i> High number of restaurants and smartphone apps Weather is not conducive to outdoor physical activities
Communication challenges	Language	Not speaking Arabic is a language barrier
	Engagement	Not compliant with treatment Patients are not committed to following advice Patients do not believe in our role as professionals Not compliant with medication, monitoring blood sugar exercise and diet control

## 5.5 Challenges in Providing Self-management Education Support to Patients With Type 2 Diabetes

In the next phase of the interview, participants were asked to discuss the challenges they face while providing self-management education support to patients with T2D. As this was the central focus of this chapter and it addresses an important question for this research, a large portion of the interviews was dedicated to this topic, and participants were encouraged to discuss their perceptions in depth. Due to the richness of their responses, their narratives (and associated subthemes) were categorised under two broader themes: cultural challenges and communication challenges. These are summarised in Table 5.1.

## 5.6 Cultural Challenges

### 5.6.1 Misconceptions

Cultural factors were often discussed as a major obstacle to patients' self-management behaviour. For example, Sofia (CE) felt that some of the female patients she sees feel pressured to comply with their perceived perceptions of attractiveness by becoming 'fatter':

Honestly, some women come to me and say they want to get fatter because their culture believes that women should be obese. This is a type of *tribe* here. So they come and ask me to increase their insulin dose. I was *shocked* when one woman told me that based on their culture, a girl before the wedding should be obese to be sexy (Sofia, CE).

Sofia (CE) felt that these perceptions may be problematic for health reasons, as they reinforce sedentary lifestyles among women in KSA. A lack of knowledge is another obstacle that adds pressure to the Diabetes Centre team. For instance, many patients feel unwilling to read and to educate themselves about diabetes, and they often evaluate their progress in health based on their mood: 'they don't use the blood sugar measuring devices—they judge their situation based on how they feel and treat themselves based on this feeling', rather than relying on more objective measures (Stephanie, CE).

Some patients feel a lot of shame regarding their health status, and are unwilling to share their feelings with their family members. This then further extends to their narratives with themselves: ‘they believe that now they are suffering from diabetes, there’s no need to burden themselves with such knowledge ... They don’t know that such carelessness increases the disease’s complications’ (Sofia, CE). Sofia also said that many patients take traditional herbs or medications that have not been scientifically validated as beneficial for their condition. Rather than consulting their HCP, many patients rely on advice from their friends and family. She expressed a lot of frustration as this adversely affects the patient’s progress:

This kind of thing makes me disappointed because they come to you and tell you this traditional herb is useful, that ‘I tried it and it worked for me and I’m fine’... Which is *not* the case. In fact, it might cause harm for themselves, based on the research, *especially* when they have a complicated case of diabetes ... It’s annoying! They think this condition is something similar to a headache, take two Panadols and they will be fine ... That, I think, is the main challenge especially with T2D, but also for Type 1. Honestly, if they are more educated and have a better understanding about their condition and the right way to deal with it... [it] saves our time (Sofia, CE).

### **5.6.2 Sedentary Lifestyle**

Many participants felt that ‘sedentary lifestyles’ and ‘laziness’ pose major barriers to providing care for people with T2D. They felt that most patients are ‘too lazy’ to exercise. The most common response they receive when encouraging their patients to become more physically active is, ‘I have no time’. Maya (CE) perceived KSA to have a leading culture of ‘eating’, even among less socioeconomically advantaged groups, who she said could still afford to eat in restaurants on a regular basis:

We first ask them to control their food consumption ... and to get familiar with food that could affect their health ... To stop drinking soft drinks and eating unhealthy food ... To be more active ... Patients are surrounded by *so many* bad things that they don’t know about ... TV and junk food restaurants ... So they just

sit in front of the TV for hours and order food ... That's *why* we have a high rate of diabetes ... People are too *lazy* to do anything ... *Honestly* ... Even people in the lower class are in a bad situation because they can still *afford* this kind of food! (Maya, CE).

Another reason the local community is considered to have a sedentary lifestyle is because some people have hired domestic help, such as housemaids, nannies and drivers, to help with their daily tasks. One participant commented:

For girls nowadays, the first thing they want or ask for when they get married is to have a maid because they are so used to having a maid when living in their parents' house ... So they do not have to do anything, not even get a cup of *water* ... They ask the maids for it. So they do not need to make any physical effort at all (Sofia, CE).

Finally, parties and social occasions also present their own obstacles as many people feel hesitant to ask for healthier food options for fear of offending their hosts. This represents a major obstacle for patients who do put a lot of effort into managing their diets, as they may feel pressured to consume food that is unhealthy for them. Stephanie (CE), for instance, commented on many of her patients' large families, and reflected on a common scenario in KSA: attending all your family members' weddings. She scoffed, and asked, 'do you really need to eat at *all* these parties?!'.

### **5.6.3 Women's Needs**

Patients' physical and social environments were also mentioned as being particularly challenging for health management. For example, three participants felt that the lack of 'health clubs' (gymnasiums) specifically designated for women in KSA is a major issue for women who actually want to exercise. They also felt that that the government of KSA needs to address this issue. According to Michelle (CE), 'the majority of men will tell you they sometimes go to the gym or to the walkway ... But women are disadvantaged in this area. There is a limited number of women's gyms'. Due to the local culture, some women cannot walk on the public walking paths created by the state unless they have a male

companion with them. According to Alyssa (RN) (and confirmed by two other participants), '[women and girls] cannot go out and exercise by themselves. They *have* to wait for a companion like a brother or husband, to accompany them'. Transport is another factor that poses challenges for women in KSA, as they are not allowed to drive. Two participants commented on this. Sofia (CE), for example, summarised a common concern among women in KSA:

Wearing the *abaya* and asking somebody to drive me [to the gym], it's not that easy. My husband might be too busy to get me there ... The government could support the availability of gym facilities in an organisation, for example in a hospital or school, similar to when you go to a Western country, you would find a gym at the university (Sofia, CE).

Some participants commented that there are not enough health club facilities, and women often struggle to find an available companion and transport. They said that another major challenge is that the majority of their patients do not have enough room in their house to exercise as many live in small apartments: 'the majority of women tell me that they have no way of getting to the gym, and not enough space in the house for exercise equipment' (Michelle, CE).

#### **5.6.4 Food Habits**

The participants indicated that patients' food habits are also a major challenge with regard to their self-management approach for patients with T2D. This includes the kind of food they eat, the significant number of restaurants and the influence of smartphone applications on their overall health. According to a number of the participants, dates, which contain large amounts of natural sugars, are regularly eaten by their patients as they are a popular food in KSA and neighbouring Arab countries. *Kabsa*, a famous national white rice-based dish, is also one of the most popular foods among people in KSA. Hannah (RN) felt that the majority of her patients, even when cooking food at home, often eat relatively unhealthy foods that are not compatible with the ideal diet for patients with T2D:



To be honest, it is difficult to implement such a thing [as healthy diets] because of customs and traditions ... To change your [way] of life [is a major challenge]. Like for patients who are used to eating five dates at a time or taking tea with sugar. How will you change this aspect? It is a big challenge for me. Anyhow, when I observe the patients, I talk to them about eating dates and *kabsa* ... [which] is very rich in carbohydrates. (Hannah, RN)

Additionally, health educators felt that the new home food delivery phone applications have a strong negative effect on people in KSA as they provide easy access to a variety of unhealthy foods delivered directly to their doorstep: ‘every day, we have new apps that make ordering food easier ... The *kids* are familiar with these ... In *one* click, they have their junk food ... They don’t even need to *read*; they can place orders using *pictures* in the apps’ (Maya, CE).

### **5.6.5 Environment**

KSA is one of few countries in the world where temperatures reach above 50°C during the summer. This was identified by several staff members as a major obstacle that prevents people from exercising outside: ‘they cannot just walk around because maybe the climate is unlike that of other countries’ (Julia, RN).

## **5.7 Communication Challenges**

### **5.7.1 Language**

Many participants felt that the Arabic language is one of the challenges that nurses face, as many nurses are from foreign countries where the native language is not Arabic. Eight of the participants, as mentioned earlier, are nurses and non-native Arabic speakers. Given that language is the primary tool by which knowledge is relayed, nurses are often frustrated by the language barrier, even if they have taken multiple Arabic language courses:

The main problem for me is the language because I cannot speak to them straight [fluent] Arabic. Other patients can understand me when I am speaking Arabic but

I need to [communicate in] sign language or sometimes I have to ask my colleagues to explain it to them (Elizabeth, RN).

### **5.7.2 Engagement**

A number of the participants expressed disappointment with patients' lack of commitment and cooperation. Often, patients do not follow the advice given to them by nurses, clinical educators and dietitians; further, they are often unwilling to take full personal responsibility for their health. According to one of the nurses, some patients are acutely aware of the negative health consequences they might face if they do not follow their advice, but still they do not want to cooperate. Instead, they want to be given medication: 'most patients are already aware of the complications, treatment, and when and how they seek medical advice ... But they are not compliant with these things (exercise, diet and treatment). The main problem is that patients only want their medicines' (Ashley, RN).

Some participants also commented on the lack of awareness about the role of health educators providing self-management education support for diabetes; this included patients' lack of willingness to listen to their educators' full session, their overall reluctance to fully discuss their lifestyle habits, and, in some cases, their complete disregard for the role of HCPs and educators who were not their primary physicians. There was a common perception that patients are not interested in undergoing education interventions, and simply want to meet with the physician who prescribes their medication, after which they hurry out of the clinic:

Some patients come here just to see the doctor and pick up their medication, not to see us ... We keep reminding them to come here, especially the 29- or 30-year-old males who are always in a hurry ... Sometimes they say, 'I'm not going to listen to you' or 'please be quick, I'm busy'... In these types of situations, I consider it to be like a competition with myself so I keep trying many times till they start to believe in me and my role as a dietitian (Maya, CE).

The lack of understanding about the importance of the educator's role was described as a major obstacle that clinical educators need to overcome when interacting with patients at

the clinic. Often, the patients' reasons for not wanting to undergo an educational intervention is that they either do not have sufficient time, or that they feel they already have adequate knowledge about diabetes and have no desire to learn more about their medical condition.

## 5.8 Summary

The purpose of this chapter was to provide an overview of the challenges in providing self-management education support to T2D patients. Several themes emerged in the data, which were categorised under the broader themes of cultural challenges and communication challenges. The purpose of this summary is to contextualise these subthemes of cultural challenges within the broader socioeconomic and cultural factors that shape people's lifestyles in KSA. This discussion should be considered with caution, however: the participants in this study were primarily reflecting on the challenges they face with a *clinical* population so the explanations provided here should not be applied to the population of KSA as a whole.

With respect to cultural challenges, it is important to note that KSA, much like many of its neighbouring Arab countries (e.g. Kuwait and Qatar), has a very wealthy, oil-based economy (Hamdan, 2005). Additionally, the culture in the Middle East is more collectivist than those of most Western countries, which are often regarded as more individualist (e.g. Scull, Khullar, Al-Awadhi & Erheim, 2014; Oyserman & Lee, 2008). This collectivism may explain why many patients with T2D rely on their friends, families and traditional healers for herbal remedies prior to consulting a licensed physician. This is true of many cultures around the world (e.g. indigenous cultures in Canada and Australia) and often found in countries that have mixed healthcare (Singer & Baer, 2012). In other words, it is not uncommon to have multiple caregiving approaches (such as traditional, or folk medicine, and physicians operating within state-controlled hospitals and clinic) co-existing in one nation. This can also explain why many patients rely on traditional knowledge, rather than medical knowledge provided by their clinical educators.

With regard to an overabundance of wealth, even those who are less wealthy can afford to hire low-income foreign workers from South and Southeast Asia as nannies, drivers and

housemaids. This may partly explain why many participants mentioned ‘sedentary lifestyle’ as a major cultural factor that inhibits patients’ motivation to complete their daily tasks on their own. For example, Sofia (CE) mentioned that many women grew up ‘having a maid’ and expect the same luxury when they marry. One unfortunate result of this, however, is that many patients decline having an active lifestyle: ‘they just sit in front of the TV for hours and order food ... That’s why we have a high rate of diabetes’ (Maya, CE). This lack of motivation may also translate to their overall health-related behaviours, such as an over-reliance on medication rather than also modifying their lifestyle. This also appears to be true for relatively low-income groups, who can still afford domestic help as well as ordering fast food on a regular basis, which, in turn, also explains the theme of unhealthy ‘food habits’. Additionally, although living in a collectivist culture has many advantages, such as family support and high social cohesiveness that often leads to overall emotional wellbeing (e.g. Scull et al., 2014), many diabetes patients may fear offending their friends and relatives on social occasions, such as weddings: this prevents many of them from asking for healthier food options and openly discussing their diabetes.

Another cultural factor that was discussed in many interviews was women’s lack of access to women’s-only gyms. KSA has a relatively male-dominated culture (Hamdan, 2005), where male relatives may feel uncomfortable allowing their sisters, daughters and wives to exercise openly in public without a trusted male companion. Similarly, women may not want to burden their male relatives to accompany them as they may be busy with other responsibilities. This prevents many women from exercising in appropriate facilities. Finally, the fact that KSA has an extremely hot climate means that many diabetes patients are unwilling to exercise outside. Therefore, participants felt that if the KSA government opened more gymnasiums that were accessible for women, many of their female patients would exercise more and improve their overall health. These factors explain why many patients felt that more women suffered from diabetes and obesity than men.

Communication challenges can also partly be explained by KSA’s cultural and socioeconomic nuances. With regard to language, for example, the over-dependence on foreign workers in KSA may be an issue that the government needs to solve at a national level. Most of the nurses were from Asia and did not speak fluent Arabic. Therefore, the

government of KSA could help solve this issue by (1) encouraging more local Saudi Arabians to receive education and training as allied health professionals, and (2) by promoting Arabic language courses for foreigners so they can communicate more effectively with the local population. The following section outlines additional recommendations suggested by the participants to help current clinical educators provide self-management education support to patients with T2D in KSA.

## **5.9 Recommendations**

### **5.9.1 How to Deal With Challenges**

Overall, the participants felt that the Arabic language and patient adherence to their treatment plans were the main barriers that the health education team is currently facing. In an attempt to deal with this language barrier, the participants said that they find it helpful to ask their local Arabic-speaking colleagues to help them translate their recommendations for patients: ‘if I already tried my best and explained to them but *still* they don’t understand, then I ask my seniors to help me explain [the recommendations] to the patient’ (Elizabeth, RN). As for the patients’ perceived disregard for advice and guidance, the majority of participants felt that it was important to practice patience with their patients, and to keep trying. In other words, every time they interact with the patients, they should try to play a more empathic role by understanding their patients’ needs and behaviours (i.e., build relationships with their patients) to communicate more effectively with them, and educate them. Humour, for example, was perceived to be an effective method, along with encouraging patients to model other, more motivated patients’ behaviours, or help them understand what their negative outcomes would be if they followed the same path as some of the less motivated patients:

Maybe by [playfully] teasing them ... So I start to talk to them about the complication of diabetes and how it affects their life ... You know most of my patients are at a pre-diabetes stage so usually I let them imagine what would happen to them if they did not follow my instructions ... I talk about different patients [without disclosing their identity] with complications so that might encourage them to start taking precautions. Alternatively, I talk about the bright

side of being healthy ... So by doing this, they [sometimes] respond positively (Maya, CE).

### **5.9.2 Factors Enhancing Self-management Behaviour**

In the final section of the interview, the participants were asked to discuss some of the factors they thought would enhance self-management behaviour for patients with T2D. They identified multiple factors including diet control, exercise, lifestyle modification, regular checks for blood sugar, regular follow-up consultations with their doctors and compliance with their medication. A healthier diet was one of the most recommended behaviours that 10 staff members felt all their patients should consider for better health outcomes: 'I usually tell our patients that diabetic management is like a table with three legs. This is diet, treatment and exercise. So, remove one of these and your diabetes will not be controlled. Simple as that' (Helen, RN).

As mentioned above, physical activity was the second most valuable piece of advice that participants felt needed to be followed by their patients to enhance self-management behaviour. Lifestyle modification was the third, and was discussed by six participants who thought people in KSA should consider increasing their physical activity—not only to help manage their diabetes, but for other conditions, as well as their overall health and wellbeing:

Increasing physical activity doesn't mean joining a gym but means changing your lifestyle. For example, using the stairs instead of an elevator; instead of pulling over near the shop, park a distance away and walk; instead of going to a nearby mosque you can walk to one that is further away ... We are not so worried about them losing weight as much as getting them moving and changing their lifestyles. Reducing the amount of food is not our aim but changing the quality of food is what we are after in the sense that they can eat the same amount of food but only half the amount should be rice and the rest is meat or salad (Stephanie, CE).

Five participants also mentioned that monitoring blood sugar on a regular basis in accordance with doctors' instructions is extremely important for harm reduction: 'patients

need to check their blood sugar level at home every day ... It's very important that they do this ... When they know exactly what their blood sugar level is, they will find the best way to deal with it' (Sofia, CE). The participants also agreed that regular follow up with doctors is a useful way to improve the quality of life of patients with diabetes. Three participants confirmed that taking medication continuously and as instructed by the doctor is a factor associated with good self-management behaviour.

## **5.10 Summary**

The purpose of the previous section was to highlight some of the recommendations that participants had for enhancing patients' self-management behaviour; most participants demonstrated a great deal of commitment and dedication towards helping patients manage their T2D. For instance, some said that even with the language barrier—which is a major obstacle for them—they manage to convey their advice to patients by relying on some of their Arabic-speaking colleagues. This demonstrates their willingness to work as a team, which is also reflective of the Diabetes Centre's multilevel and multidisciplinary healthcare team approach. The participants' stories also demonstrated that providing 'education' and providing 'care' often go hand in hand: these participants demonstrated a commitment to their patients' wellbeing by recommending a more patient and empathic approach to providing education. Interestingly, this is in sharp contrast to some of the opinions held by medical anthropologists regarding how care is practiced in many medical settings. Kleinman and van der Geest (2009), for example, critically discussed how 'care' is, ironically, often stripped away within the paradigm of biomedicine; that physicians can often forget that their patients are people, rather than objects of biological management. Allied health professionals, however, play an extremely critical role in providing care to patients. The following quote perfectly captures the commitment that many of the participants in the current study demonstrated towards their patients:

Aside from skilled nursing, rehabilitation efforts ... And the practical assistance of [allied health professionals], caregiving has relatively little to do with medicine ... Caregiving begins with the clinical ethical act of acknowledging the situation of the sufferer, affirming their efforts and those of family and friends to respond

to pain and impairment, and demonstrating emotional and moral solidarity with those efforts (Kleinman & van der Geest, 2009, pp. 162–163).

## **5.11 Conclusion**

The third, and qualitative phase of this study, revealed much valuable information that could help improve healthcare service delivery at the KFMC's Diabetes Centre, and benefit the overall T2D patient population in KSA. Thirteen clinical —nurses, health educators and dietitians (who often had very overlapping roles and responsibilities)—discussed some of the most common patient demographics they interact with at the Diabetes Centre and how they provide self-management education support to the patients who visit them. They also reflected on many of the cultural and communication challenges they face while providing care, and provided several recommendations that they felt would improve healthcare service delivery.

Although none of the professionals interviewed had postgraduate training (e.g. at the master or doctoral level), many of them showed their dedication to breaking down some of the barriers that prevent people with T2D from improving their self-management behaviour, thereby highlighting their resourcefulness as effective allied health professionals and educators. Nonetheless, it appears that KSA still has many obstacles to overcome to provide better support to both patients with T2D as well as the support staff at hospitals who support patients. First, KSA needs to demonstrate further commitment to patient—particularly women—by improving access to women-only gymnasiums. Additionally, to overcome the language barrier discussed by many non-Arab participants, the government should consider supporting language classes for people working in the health sector, and further encouraging the local, Arabic-speaking population to enrol in professional training programs (e.g. as clinical educators and nurses) to reduce the language gap in healthcare. Finally, one participant felt that an online group therapy and educational program has the potential to help many patients at the Diabetes Centre; therefore, the government should consider allocating a budget towards this program.

Despite being a possible obstacle with regard to patients' over-reliance on seeking advice from friends, family and traditional healers, KSA's collectivistic culture may actually



mediate a more ‘caring’ healthcare environment for patients suffering from T2D. This dedication to supporting the local population is vital for any effective healthcare system (Kleinman & van der Geest, 2009; Singer & Baer, 2012). The qualitative research findings of this study demonstrate healthcare provisions are quite healthy for patients with T2D, and that many of the challenges that patients and their educators face can be overcome by increased support from their local government.

## **Chapter 6: Patients' Diabetes Knowledge, Diabetes Self-care Activities and Healthcare Professionals' Diabetes Attitude—A Quantitative Study**

### **6.1 Introduction**

This chapter presents the results of the quantitative analysis of data collected in Phase 1 and 2 using the DKT, the SDSCA and the DAS-3 surveys. The objectives of the analysis were as follows:

- to explore differences on diabetes knowledge, utilising the DKT with respect to various demographic characteristics of T2D patients (Phase 1).
- to assess the adherence of T2D patients to self-care activities, through the SDSCA extended SDSCA surveys (Phase 1).
- to assess nurses' perceptions in KSA regarding care for T2D patients, using the DAS-3 survey (Phase 2).

Frequencies and percentages were used to summarise patients' responses to each question in the DKT and the SDSCA extended survey. Means and standard deviations were used to summarise the responses to the SDSCA and the DAS-3 surveys. Hypothesis testing was performed using one-way ANOVA and unpaired *t*-tests to determine whether there were significant differences in patients' diabetes knowledge level according to their demographic characteristics. The data were analysed using SPSS v. 23.

### **6.2 Phase 1: Demographic Characteristics**

Demographic data collected from the patients in Phase 1 included their HbA1c level, age group, gender, monthly income, smoking status, time since diagnosis, education level and presence of other diseases. As shown in Table 6.1, the majority of patients were non-smokers ( $n = 207$ , 83.8%). Males and females were about equally represented in the sample: 50.2% were males ( $n = 124$ ) and 49.8% were females ( $n = 123$ ). The majority of the patients were aged 18–30 years ( $n = 106$ , 42.9%). They differed in terms of income:

almost half earned less than SAR 5,000 per month ( $n = 109$ , 44.2%). Concerning the level of education, approximately half of the patients had a bachelor degree ( $n = 103$ , 41.7%) but only 2.4% had a postgraduate degree ( $n = 6$ , 2.4%).

**Table 6.1: Patients' demographic characteristics in Phase 1 ( $n = 247$ )**

Characteristics		<i>n</i>	%
Age group (years)	18–30	106	42.9
	31–45	67	27.1
	46–55	31	12.6
	>55	43	17.4
Gender	Male	124	50.2
	Female	123	49.8
Monthly income (SAR)	<5.000	109	44.1
	5.000–< 10.000	82	33.2
	10.000–15.000	25	10.1
	>15.000	31	12.6
Smoking status	Currently	21	8.5
	No	207	83.8
	Yes	19	7.7
Education level	Elementary school	28	11.3
	Middle school	28	11.3
	High school	82	33.2
	Bachelor degree	103	41.7
	Postgraduate degree	6	2.4

As shown in Table 6.2, the majority of patients had been diagnosed with T2D for more than 10 years ( $n = 76$ , 30.8%); 29.6% had been diagnosed 8–10 years prior to the study ( $n = 73$ ); and only 4.9% had been diagnosed less than 2 years prior ( $n = 12$ ). Nearly half of the patients had at least one disease other than diabetes ( $n = 94$ , 38.1%); 22.7% had only T2D ( $n = 56$ ). Half of the patients had poor diabetic control as demonstrated by the HbA1c test ( $n = 122$ , 49.4%).

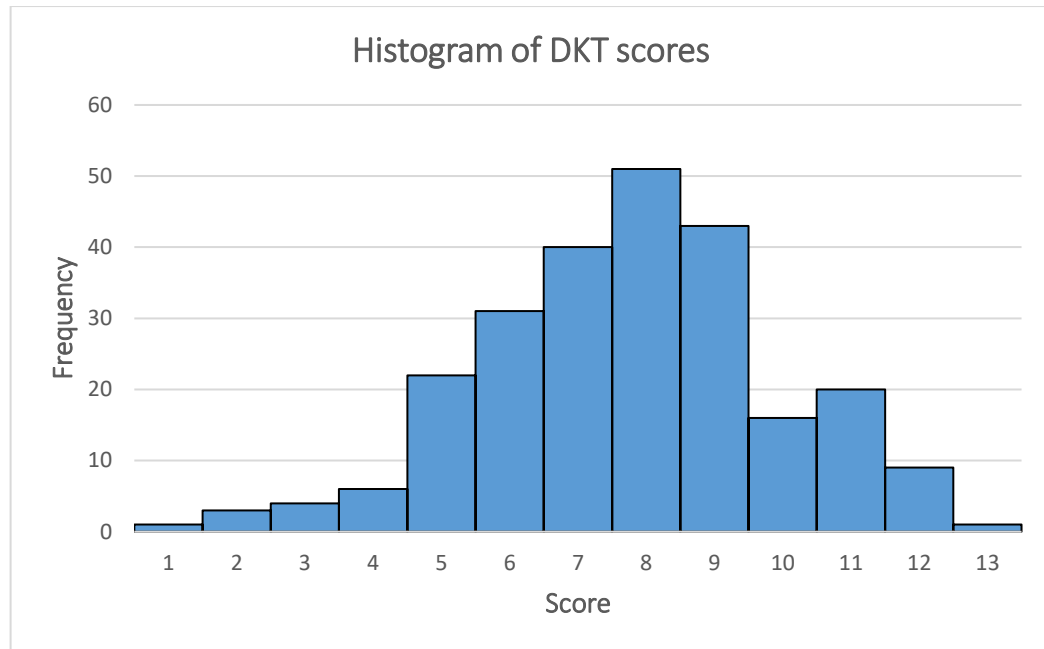
**Table 6.2: Patients' diabetes-related characteristics in Phase 1 ( $n = 247$ )**

Characteristics		$n$	%
HbA1c level	Good control	51	20.6
	Acceptable control	74	30.0
	Poor control	122	49.4
Other diseases	Cardiac	10	4.0
	Blood pressure	24	9.7
	Kidney	6	2.4
	Eye	57	23.1
	>1	94	38.1
	None	56	22.7
Time since diagnosis (years)	<2	12	4.9
	2–4	32	13.0
	5–7	54	21.9
	8–10	73	29.6
	>10	76	30.8

### 6.3 Diabetes Knowledge Level

The first step in the analysis process was to calculate the patients' total score as presented in table 6.3, where 0 indicates no knowledge and 14 reflects perfect knowledge. A histogram of the total scores showed that the DKT score was approximately normally distributed with a slight left skew (Figure 6.1). Only one patient scored 13/14 and one scored 1/14.

The pass score for the DKT test is 50%, which is achieved with a score of 7/14. From Table 6.3, it can be seen that 72.9% of the patients achieved a score of 50% or above (7/14 or greater) while 27.1% failed to do so. However, 51 patients (20.6%) received a score of 8, which is just above the pass score.



**Figure 6.1: Histogram of DKT scores**

**Table 6.3: Summary of patients' knowledge score ( $n = 247$ )**

Score	<i>n</i>	%	Cumulative %
1	1	0.4	0.4
2	3	1.2	1.6
3	4	1.6	3.2
4	6	2.4	5.7
5	22	8.9	14.6
6	31	12.6	27.1
7	40	16.2	43.3
8	51	20.6	64.0
9	43	17.4	81.4
10	16	6.5	87.9
11	20	8.1	96.0
12	9	3.6	99.6
13	1	0.4	100

The distribution of scores (see Table 6.4) had a mean of 7.8 with an average spread around the mean described by a standard deviation of 2.17. This indicates that diabetes knowledge is barely average in this sample of Saudi T2D patients. This can be confirmed by examining Table 6.3, where more than half (54.2%) achieved a score of 7–9.

As shown in Table 6.5, 14 questions were answered by each patient. The majority of patients gave correct answers to questions 1, 4, 6, 8, 9 and 11–14. However, more than half were not able to correctly answer questions 2, 3, 5 and 10. Patients were divided into three categories based on their knowledge regarding diabetes as defined by Al-Adsani et al. (2009):

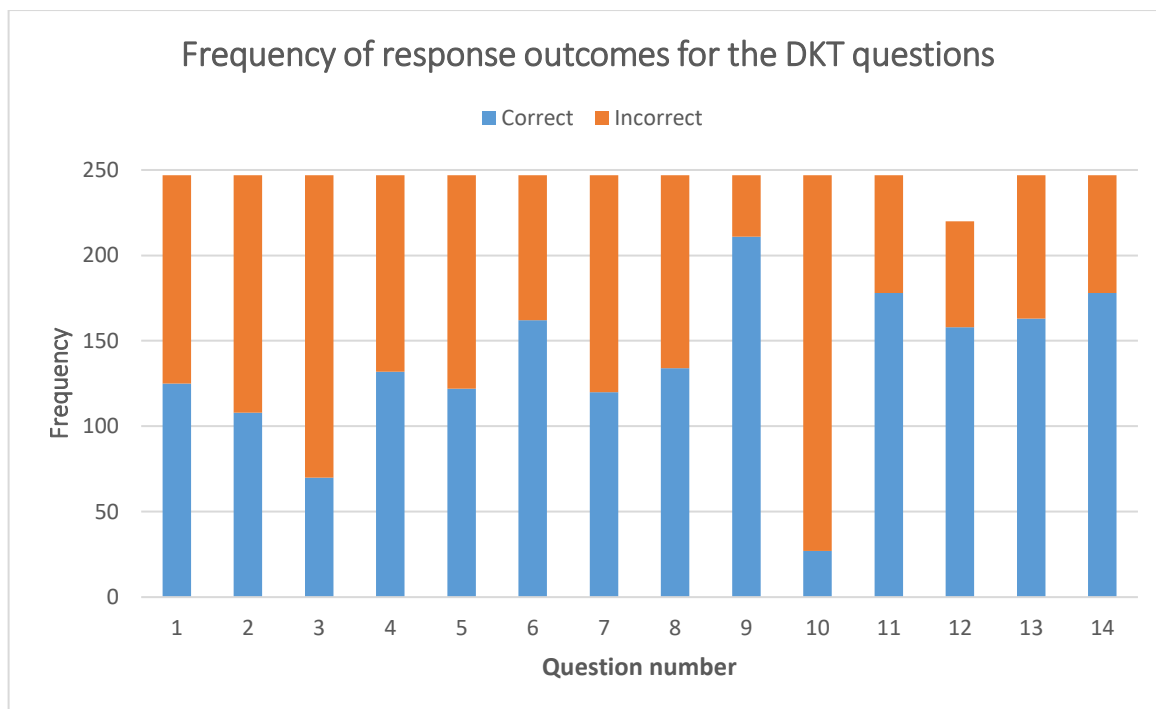
- scores of 1–6 indicated poor knowledge
- scores of 7–8 indicated an acceptable level of knowledge
- scores of 9–13 indicated a good level of knowledge.

**Table 6.4: Descriptive statistics for Diabetes Knowledge Test scores in a sample of Saudi Type 2 diabetic patients**

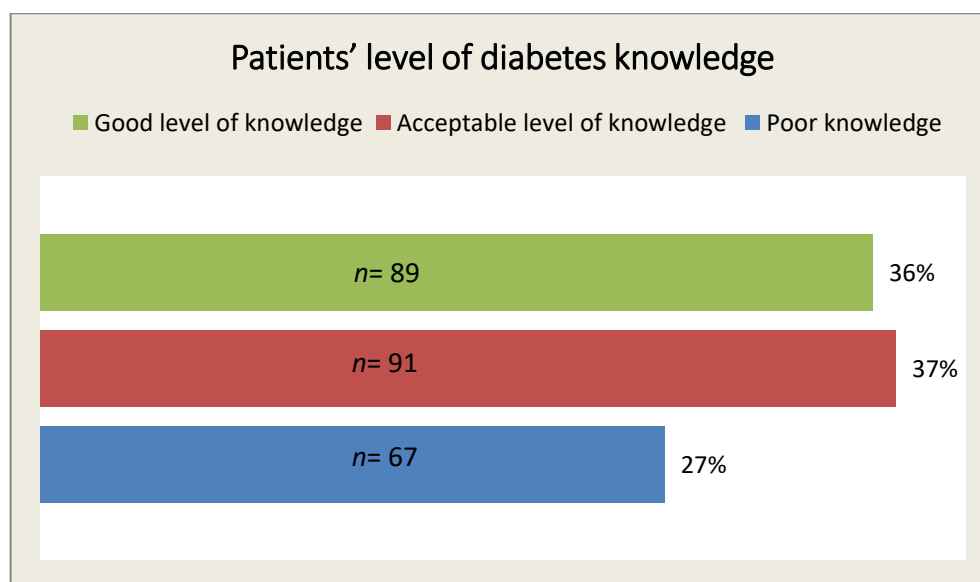
	n	Range	Minimum	Maximum	Mean	Std. deviation	Skewness	
							Value	Std. Error
Total score	247	12	1	13	7.75	2.17	–0.195	0.155

**Table 6.5: Summary of patients' responses to the 14 items of the Diabetes Knowledge Test**

Question	Response outcome	
	Correct	Incorrect
1	125 (50.2%)	122 (49.8%)
2	108 (43.7%)	139 (56.3%)
3	70 (28.3%)	177 (71.7%)
4	132 (53.4%)	115 (46.6%)
5	122 (49.4%)	125 (50.6%)
6	162 (65.6%)	85 (34.4%)
7	120 (48.6%)	127(51.4%)
8	134 (54.3%)	113 (45.7%)
9	211 (85.4%)	36 (14.6%)
10	27 (10.9%)	220 (89.1%)
11	178 (72.1%)	69 (29.9%)
12	158 (74.9%)	62 (25.1%)
13	163 (66%)	84 (34%)
14	178 (72.1%)	69 (27.9%)



**Figure 6.2: Frequency of response outcomes for the DKT questions**



**Figure 6.3: Patients' level of diabetes knowledge**

The majority of patients, as shown in Figure 6.3, had an acceptable knowledge level regarding T2D ( $n = 91$ , 37%); 36% had good knowledge ( $n = 89$ ); and 27% had poor knowledge ( $n = 67$ ).



### 6.3.1 Analysis of Diabetes Knowledge Score With Respect to Demographic Characteristics

In this analysis, one-way ANOVA and unpaired *t*-tests were used to assess differences in diabetes knowledge scores according to patients' demographic characteristics: HbA1c level, age group, gender, monthly income group, smoking status category, time since diagnosis category, education level and having diseases other than diabetes.

### 6.3.2 Assessing Diabetes Knowledge Score Across Glycaemic Control Categories (HbA1c)

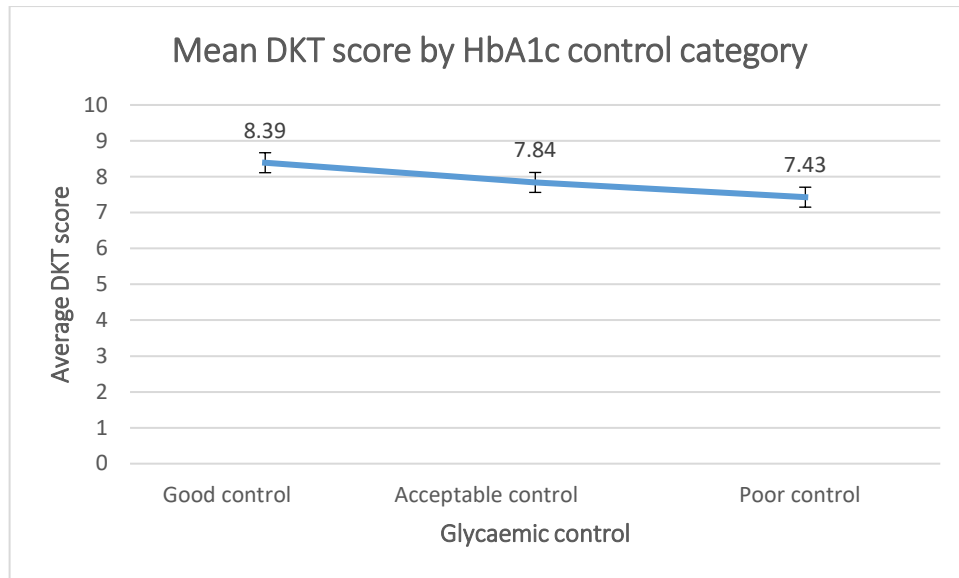
Patients were asked to provide their current HbA1c level. They were categorised into three groups as recommended by the American Diabetes Association guidelines (Al-Maskari et al., 2013):

- poor control (HbA1c < 7)
- acceptable control (HbA1c 7–8)
- good control (HbA1c > 8).

**Table 6.6: One-way ANOVA for Diabetes Knowledge Test mean scores across HbA1c categories**

Control type	Good (HbA1c < 7) <i>n</i> = 51	Acceptable (HbA1c 7–8) <i>n</i> = 74	Poor (HbA1c > 8) <i>n</i> = 122	<i>F</i> (2, 244)	<i>p</i>
Mean ( <i>SD</i> )	8.39 (2.24) <sup>a</sup>	7.84 (1.89)	7.43 (2.24) <sup>a</sup>	3.67	0.027

One-way ANOVA was performed with Bonferroni post-hoc tests for pairwise comparisons; groups that are significantly different from each other are denoted with similar superscript letters



**Figure 6.4: Mean DKT score by HbA1c control category**

A one-way ANOVA was conducted to assess whether there were significant differences in knowledge level as measured by the DKT among categories of diabetes control (assessed via HbA1c) (see Table 6.6). The analysis indicated that there was a statistically significant difference across categories  $F(2, 244) = 3.67, p = 0.027$  on mean knowledge scores. This is illustrated in Figure 6.4, which shows an increase in DKT mean score as glycaemic control improves.

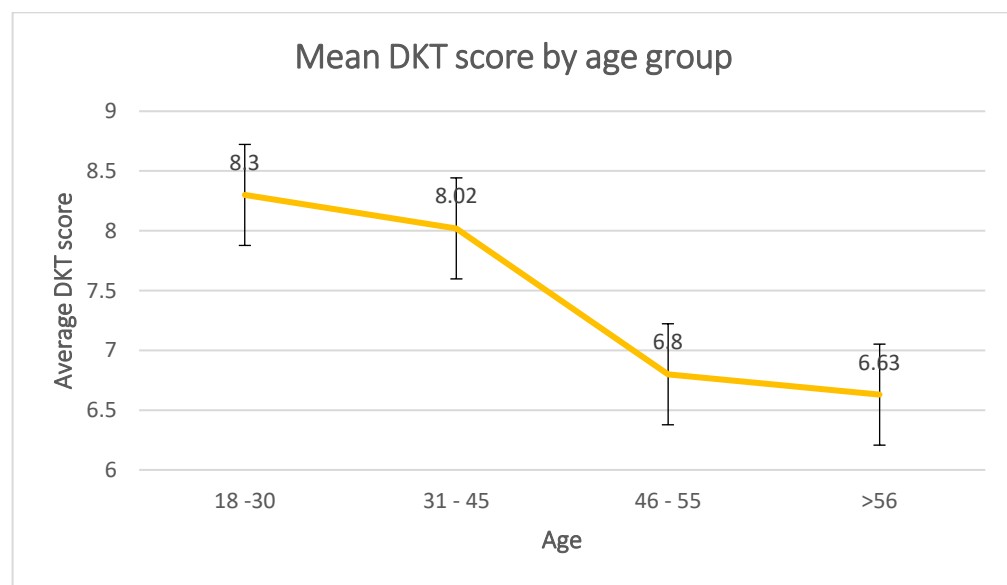
Further, post-hoc comparisons using Bonferroni  $t$ -tests indicated that the mean DKT score for patients with good control ( $M = 8.39, SD = 2.24$ ) was significantly higher than that for those with poor control ( $M = 7.43, SD = 2.24$ ) ( $p = 0.024$ , 95% confidence interval [CI] for mean difference: 0.096, 1.820). Mean DKT score in patients with acceptable control ( $M = 7.83, SD = 1.88$ ) did not differ significantly from that in patients with poor or good control. This can be explained by the fact that higher knowledge score is associated with better glycaemic control; thus, the lower the HbA1c in patients, the higher the DKT score. As patients' level of knowledge regarding their disease increases, there is better glycaemic control and therefore HbA1c (a measure of diabetic control) tends to be lower in these patients with a high level of knowledge.

### 6.3.3 Assessing Diabetes Knowledge Score Across Age Groups

**Table 6.7: One-way ANOVA for Diabetes Knowledge Test mean score across various age groups**

Age (years)	18–30	31–45	46–55	>55	$F(3,243)$	$p$
DKT score						
Mean (SD)	8.3 (2.05) <sup>a b</sup>	8.02 (1.94) <sup>c</sup>	6.8 (2.66)	6.63 (1.81) <sup>b c</sup>	9.16	<0.001

Hypothesis testing was performed using a one-way ANOVA with Bonferroni post-hoc test for pairwise comparisons; groups that are significantly different from each other were denoted with similar superscript letters



**Figure 6.5: Mean DKT score by age group**

A one-way ANOVA showed that there was a statistically significant difference in DKT scores across age groups  $F(3,243) = 9.16$ ,  $p < 0.001$  (see Table 6.7). Post-hoc comparisons using Bonferroni  $t$ -tests showed that the mean score in patients aged 18–30 ( $M = 8.30$ ,  $SD = 2.04$ ) was significantly higher than the mean score in patients aged 46–55 ( $M = 6.83$ ,  $SD = 2.65$ ) ( $p = 0.004$ , 95% CI of mean difference: 0.34, 2.59) and patients older than 55 years of age ( $M = 6.62$ ,  $SD = 1.81$ ) ( $p < 0.001$ , 95% CI of mean difference: 0.68, 2.67).

The knowledge mean score in the 31–45-year age group was significantly higher than the mean score ( $M = 8.02$ ,  $SD = 1.93$ ) in patients older than 55 years only ( $M = 6.62$ ,  $SD = 1.81$ ) ( $p = 0.004$ , 95% CI of mean difference: 0.33, 2.48). Figure 6.5 shows an inverse relationship between age group and DKT with a decrease in DKT mean score after the age of 45 years. This can be attributed to the fact that the younger generation is more engaged with technology. Moreover, there has been rapid economic development in KSA for the last 10 years that has positively influenced patients' diabetes knowledge level. Also, younger patients are more capable of accessing drug-related knowledge resources than older patients, which may be the reason why DKT scores are higher for patients younger than 45 years than for those older than 45 years.

#### 6.3.4 Assessing Diabetes Knowledge Score Across Gender

An unpaired  $t$ -test was conducted to compare diabetes knowledge levels in males and females. There was no significant difference in mean scores between males and females, as shown in Table 6.8. Thus, gender is not associated with diabetes knowledge.

**Table 6.8: Unpaired  $t$ -test results for the Diabetes Knowledge Test mean score across males and females**

Gender DKT score	Male	Female	$t$ (245)	$p$
	Mean ( $SD$ )	Mean ( $SD$ )		
	7.77 (2.19)	7.74 (2.16)	0.095	0.924

#### 6.3.5 Assessing Diabetes Knowledge Score Across Income Groups

Patients were divided into four groups based on their monthly income as follows: <SAR5,000 SAR; SAR5,000–<10,000; SAR10,000–<15,000;  $\geq$ SAR15,000 per month.

**Table 6.9: One-way ANOVA of Diabetes Knowledge Test mean score across monthly income groups**

Income (SAR) \ DKT score					$F(3,246)$	$p$
	<5,000	5,000– <10,000	10,000– <15,000	15,000		
Mean (SD)	7.42 (2.26)	7.91 (2.03)	8.16 (2.34)	8.16 (1.98)	1.67	0.173

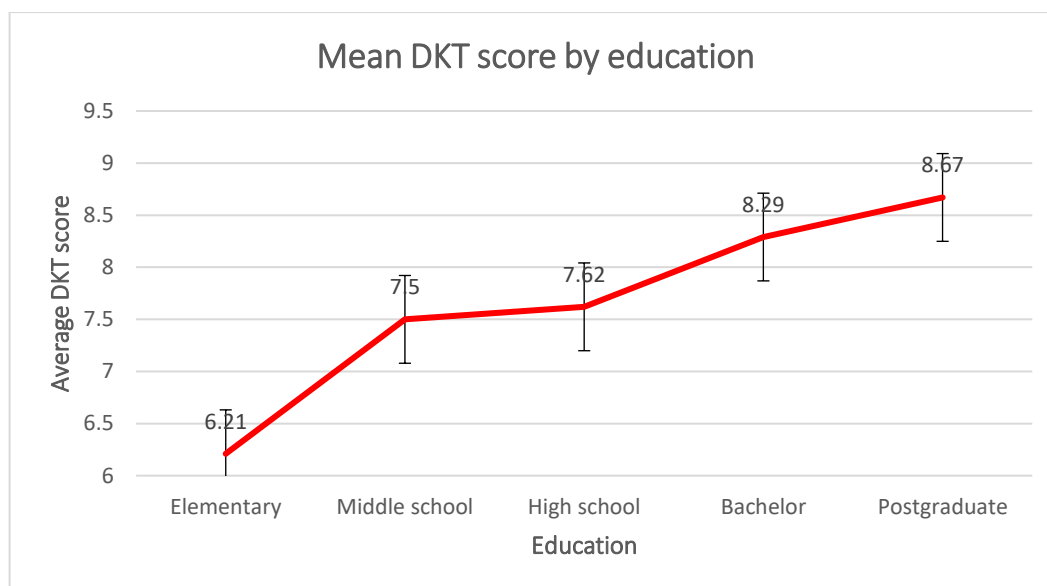
A one-way between-group ANOVA was conducted to determine whether there were any significant differences in diabetes knowledge, as measured by the DKT, across income groups (see Table 6.9). Although the mean DKT score increased with increasing income, there was no significant difference in the mean diabetes knowledge score across various income groups  $F(3,246) = 1.673$ ,  $p = 0.173$ . This may be attributed to small differences between groups, which may require a larger sample size to detect.

### 6.3.6 Assessing Diabetes Knowledge Score Across Education Level Categories

Patients were divided into five categories according to their level of education (elementary school, middle school, high school, bachelor degree, postgraduate degree).

**Table 6.10 : One-way ANOVA of Diabetes Knowledge mean score across education level categories**

Education \ DKT score	Elementary school	Middle school	High school	Bachelor degree	Postgraduate degree	$F(4,242)$	$p$
Mean (SD)	6.21 (1.93) <sup>a b</sup>	7.5 (2.43)	7.62 (2.02) <sup>a</sup>	8.29 (2.05) <sup>b</sup>	8.67 (2.66)	6.00	<0.001



**Figure 6.6: Mean DKT score by education**

As shown in Table 6.10, there was a statistically significant difference in DKT score across the various education level categories ( $F(4,242) = 6.00, p < 0.001$ ). Post-hoc comparisons using the Bonferroni  $t$ -test indicated that the mean score in patients who completed only elementary school ( $M = 6.21, SD = 1.93$ ) was significantly lower than the mean score in patients who completed high school ( $M = 7.62, SD = 2.01$ ) ( $p = 0.023$ , 95% CI of mean difference:  $-2.70, -0.12$ ) and patients with a bachelor degree ( $M = 8.29, SD = 2.04$ ) ( $p < 0.001$ , 95% CI of mean difference:  $-3.34, -0.82$ ). No other significant differences were detected between education level categories other than the ones previously mentioned. Figure 6.6 confirms that knowledge regarding diabetes tends to increase with the increase in the educational level of the patient. The fact that patients who only received elementary education have lower mean DKT scores than those with high school and bachelor degrees can be explained by the fact that these individuals have lower overall knowledge than those who are well educated and have higher qualifications such as a bachelor degree or even just high school completion.

### 6.3.7 Assessing Diabetes Knowledge Score According to Time Since Diagnosis

Table 6.11 shows that there is no significant difference in mean diabetes knowledge score across time categories since diagnosis ( $F(4,242) = 1.50, p = 0.204$ ).

**Table 6. 11: One-way ANOVA of Diabetes Knowledge Test score according to time since diagnosis**

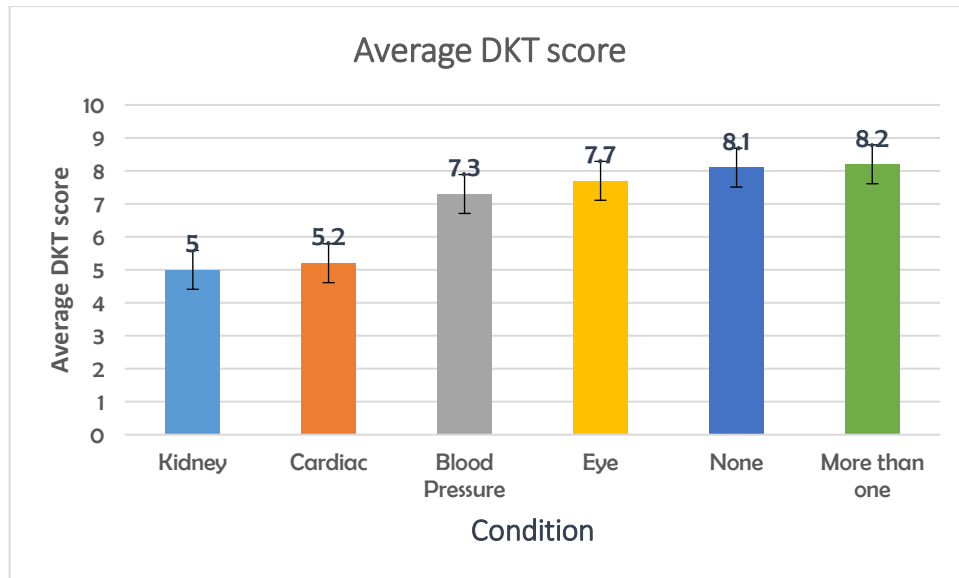
Time (years) DKT score	<2	2–4	5–7	8–10	≥10	<i>F</i> (4,242)	<i>p</i>
Mean ( <i>SD</i> )	7.83 (1.19)	7.31 (1.79)	8.22 (1.9)	7.92 (2.32)	7.43 (2.41)	1.50	0.204

### 6.3.8 Assessing Diabetes Knowledge Score According to Co-existing Diseases Status

Patients were divided into six groups according to how many diseases they had in addition to diabetes as follows: Group 1: cardiac; Group 2: blood pressure; Group 3: kidney; Group 4: eye; Group 5: more than one; Group 6: none.

**Table 6.12: One-way ANOVA for the Diabetes Knowledge Test mean score across multiple disease categories**

Problem DKT score	Cardiac	Blood pressure	Kidney	Eye	More than one	None	<i>F</i> (5,241)	<i>p</i>
Mean ( <i>SD</i> )	5.2 (2.6) <sup>a</sup>	7.3 (1.73)	5 (3.29) <sup>b</sup>	7.7 (2.1) <sup>a</sup> <sub>b</sub>	8.2 (1.99) <sup>a b</sup>	8.1 (2.03) <sup>a</sup> <sub>b</sub>	6.49	<0.001



**Figure 6.7: Average DKT score**

One-way ANOVA test results revealed a statistically significant difference in mean DKT score across the six groups ( $F(5,241) = 6.49$ ,  $p < 0.001$ ) (see Table 6.12). Post-hoc comparisons using the Bonferroni  $t$ -test indicated that the mean score in diabetic patients with cardiac patients ( $M = 5.20$ ,  $SD = 2.52$ ) was significantly lower than the mean score in patients who have eye disease ( $M = 7.70$ ,  $SD = 2.09$ ) ( $p = 0.007$ , 95% CI of mean difference:  $-4.59$ ,  $-0.41$ ) more than one disease ( $M = 8.15$ ,  $SD = 1.98$ ) ( $p < 0.001$ , 95% CI of mean difference:  $-4.99$ ,  $-0.93$ ) and no disease ( $M = 8.07$ ,  $SD = 2.02$ ) ( $p = 0.001$ , 95% CI of mean difference:  $-4.96$ ,  $-0.78$ ).

Diabetic patients with kidney problems ( $M = 5.00$ ,  $SD = 3.28$ ) also had a significantly lower DKT mean score than diabetic patients with eye disease ( $M = 7.70$ ,  $SD = 2.09$ ) ( $p = 0.037$ , 95% CI of mean difference:  $-5.32$ ,  $-0.09$ ) patients with more than one disease ( $M = 8.15$ ,  $SD = 1.98$ ) ( $p = 0.005$ , 95% CI of mean difference:  $-5.73$ ,  $-0.59$ ) and patients with no disease ( $M = 8.07$ ,  $SD = 2.02$ ) ( $p = 0.009$ , 95% CI of mean difference:  $-5.69$ ,  $-0.45$ ).

This suggests that diabetic patients with kidney or cardiac problems have lower knowledge mean score than diabetic patients with either eye problems, more than one problem or no problem at all. One possible explanation is that patients with lower knowledge regarding the harmful effects of T2D on the kidney and the heart (as these progress silently over time without being noticed if no routine checks are performed) tend to be diagnosed with such



problems due to their lower knowledge status. The opposite can be noted in those with no diseases as these individuals are disease free due to their higher level of knowledge. The same can be said for those with more than one disease or eye diseases, as these individuals tend to learn more about their condition as such problems (e.g. eye problems) begin to interfere with patients' daily life activities and force them to learn more about their condition.

### 6.3.9 Assessing Diabetes Knowledge Score Across Smoking Status Categories

A one-way between-group ANOVA as presented in Table 6.13 was conducted to determine whether there was a significant difference in knowledge mean score across smoking status categories as measured by the DKT. However, there was no significant difference ( $F(2,244) = 2.92, p = 0.056$ ) in the mean knowledge score across the smoking status categories.

**Table 6.13: One-way ANOVA on Diabetes Knowledge Test mean score across smoking status categories**

Smoking status DKT score	Current smoker	Non-smoker	Ex-smoker	$F(2,244)$	$p$
Mean ( <i>SD</i> )	7.57 (2.27)	7.67 (2.19)	8.89 (2.58)	2.92	0.056

## 6.4 Patients' Adherence to the Type 2 SDSCA and Extended SDSCA Surveys

### 6.4.1 The SDSCA Survey

Patients' adherence with the self-care activities (the second objective of Phase 1) was evaluated using the SDSCA survey. This survey consists of 14 items related to self-care activities to measure patients' behaviour concerning the self-management of T2D. Each item asks about the number of days (0–7) on which the patient did a certain activity (related to diabetes care) within the last week. The 14 items are divided into five domains:

1. diet (three items)

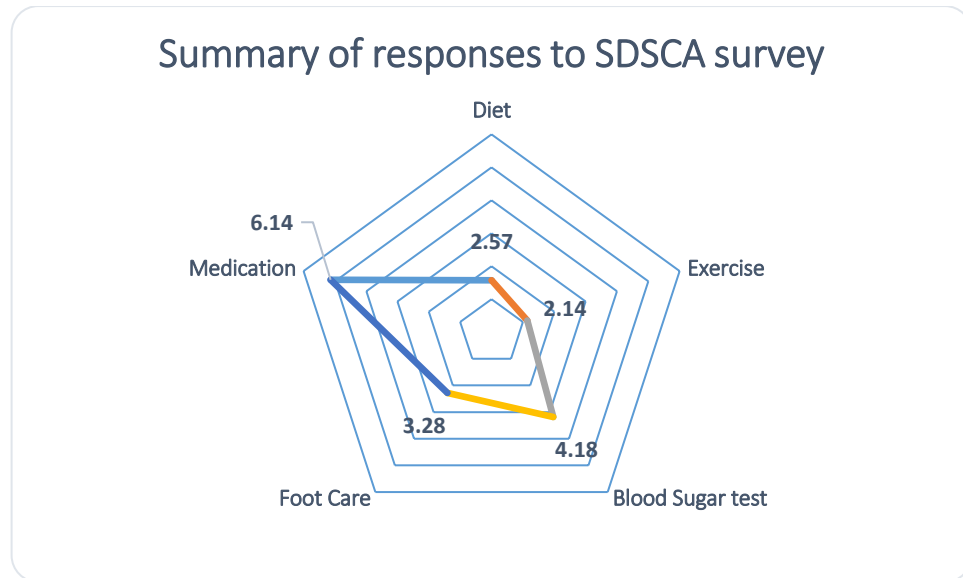
2. exercise (two items)
3. blood glucose testing (two items)
4. foot care (five items)
5. medication (two items).

A mean score was calculated for each subscale. A higher score indicates a higher adherence to diabetes self-care activities. As shown in Table 6.14, patients' adherence to medication commitment activities ( $M = 6.13$ ,  $SD = 1.25$ ) was in an active status and was the most practiced of all the domains. Glucose monitoring ( $M = 4.15$ ,  $SD = 2.42$ ) and foot care ( $M = 3.28$ ,  $SD = 1.69$ ) were at an average level compared with the patients' behaviour in relation to diet ( $M = 2.57$ ,  $SD = 1.73$ ) and exercise ( $M = 2.13$ ,  $SD = 2.00$ ), which were at a poor level (Table 6.14; Figure 6.8).

**Table 6.14: Patients' adherence to self-management activities**

Domain	Mean	Standard Deviation
Diet	2.57	1.74
Exercise	2.14	2.01
Blood sugar test	4.18	2.43
Foot care	3.28	1.69
Medication	6.14	1.25

Overall, results show that adherence to self-care activities was relatively poor: mean adherence scores were 2.14 for exercise, 2.57 for diet and 3.28 for foot care. The only subscale that achieved a high mean value was the medication domain (Table 6.14).



**Figure 6.8: Summary of responses to SDSCA survey**

## 6.5 The Extended SDSCA Survey

The SDSCA extended survey investigates four main aspects (domains):

- whether diabetic patients receive advice from the healthcare members regarding diet
- whether diabetic patients receive advice from the healthcare members regarding exercise
- whether diabetic patients receive advice from the healthcare members regarding the monitoring of glucose levels
- the type of medication prescribed to diabetic patients by doctors.

Each of the first three domains (diet, exercise, glucose monitoring) included a number of items (advice) and patients were asked whether each item of advice was provided to them by their healthcare practitioners. The proportion of patients that chose each item was calculated. Regarding the medications domain, patients were asked whether they were prescribed insulin or oral antidiabetics.

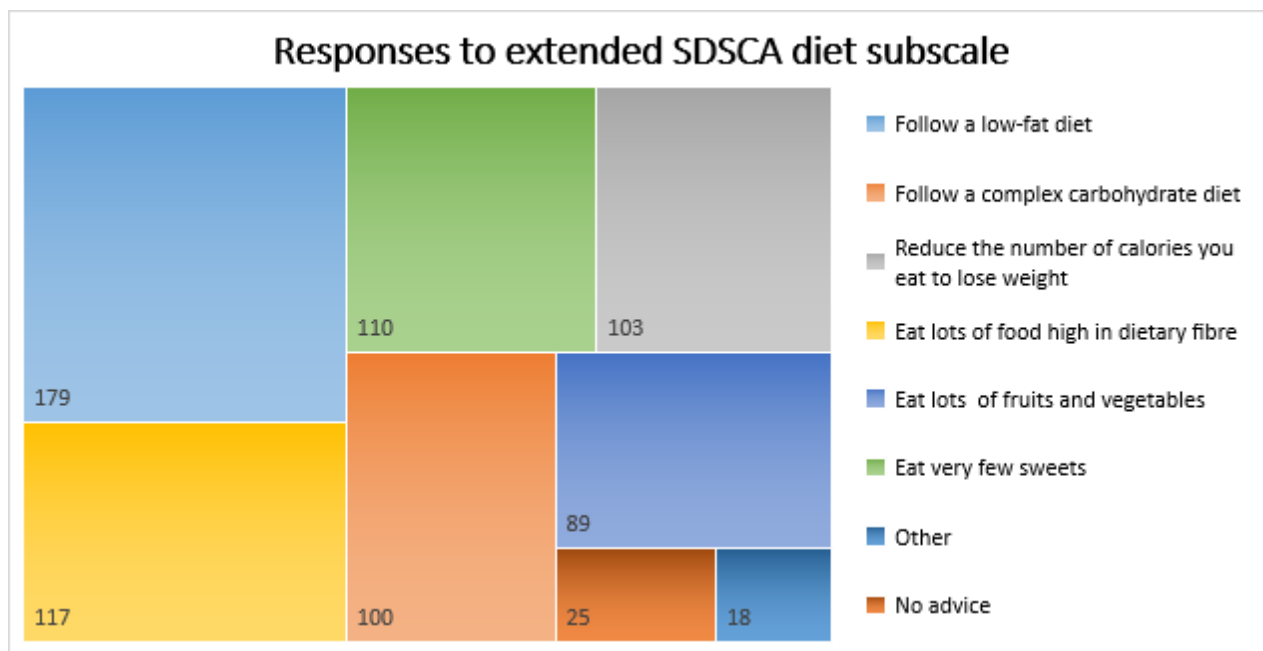
### 6.5.1 Responses to the Extended SDSCA Survey Diet Domain

Results shown in Table 6.15 revealed that 179 patients (74.3%) had been advised to follow a low-fat eating plan, and only 89 patients (36.9%) had received information concerning fruits and vegetables in their diet.

**Table 6.15: Responses to the extended SDSCA survey diet domain**

Item	Response output			
	Yes		No	
Does the healthcare team advise you to:	<i>n</i>	%	<i>n</i>	%
Follow a low-fat eating plan?	179	74.3	62	25.7
Follow a complex carbohydrate diet?	100	41.5	141	58.5
Reduce the number of calories you eat to lose weight?	103	42.7	138	57.3
Eat lots of food high in dietary fibre?	117	48.5	124	51.5
Eat lots (at least, five servings per day) of fruit and vegetables?	89	36.9	152	63.1
Eat very few sweets?	110	45.6	131	54.4
Other	18	7.5	223	92.5
I have not been given any advice about my diet by my healthcare team	25	10.4	216	89.6

Figure 6.9 shows that the most frequent advice given to patients was to follow a low-fat diet ( $n = 179$ ) while the least frequent advice was to eat lots of fruit and vegetables ( $n = 89$ ). This may be due to high fat consumption in Saudi T2D and in T2D patients generally, which makes this advice the most common among healthcare practitioners.



**Figure 6.9: Responses to extended SDSCA diet subscale**

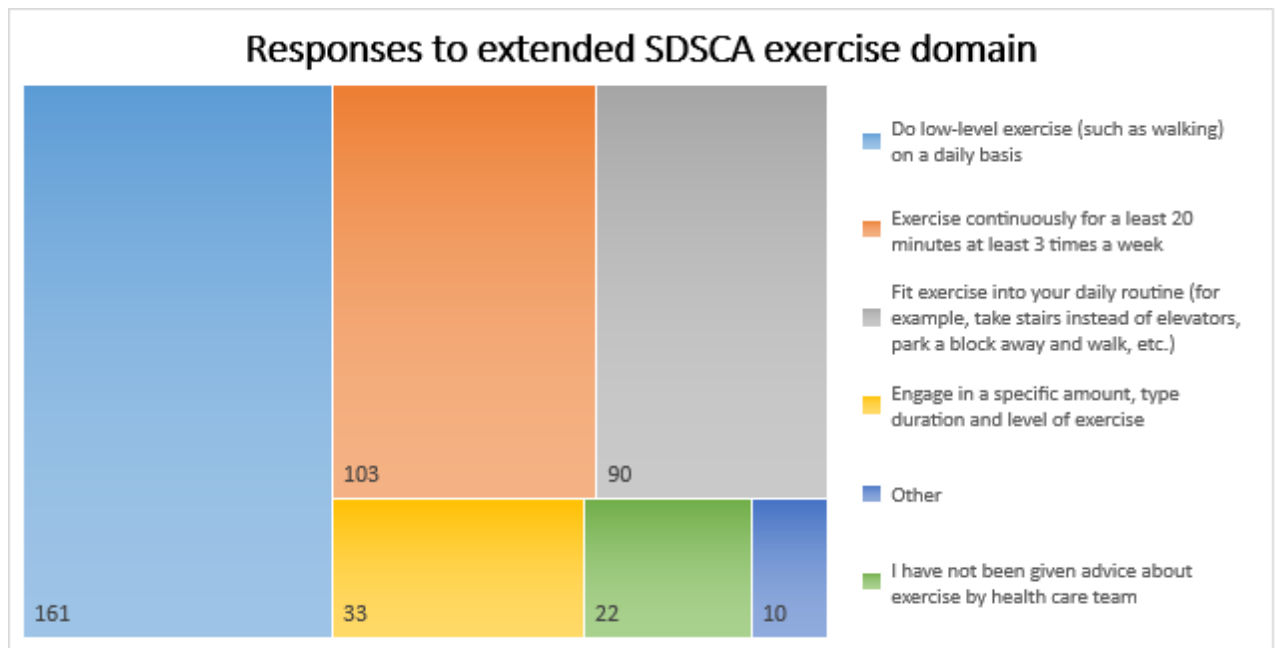
### 6.5.2 Responses to the Extended SDSCA Survey Exercise Domain

Table 6.16 provides the patients' responses concerning the exercise recommendations they received from the healthcare team at the Diabetes Centre. The majority ( $n = 161$ , 66.8%) of patients agreed that the healthcare team had advised them to do low-level exercise such as walking on a daily basis to improve their blood sugar level. Moreover, 103 patients (42.7%) had been advised to undertake continuous exercise for at least 20 minutes at least three times a week. Finally, 219 patients (90.9%) confirmed that they had been given advice about exercise by the healthcare team.

Figure 6.10 shows that the most commonly recommended activity by healthcare practitioners was doing low-level exercise ( $n = 161$ ) while the least mentioned one was fitting the exercise into the daily routine ( $n = 90$ ).

**Table 6.16: Responses to the extended SDSCA survey exercise domain**

Item	Response			
	Yes		No	
Does the healthcare team advise you to:	<i>n</i>	%	<i>n</i>	%
Do low-level exercise (such as walking) on a daily basis?	161	66.8	80	33.2
Exercise continuously for a least 20 minutes at least three times a week?	103	42.7	138	57.3
Fit exercise into your daily routine (e.g. take stairs instead of elevators, park a block away and walk)?	90	37.3	151	62.7
Engage in a specific amount, type, duration and level of exercise?	33	13.7	208	86.3
Other	10	4.1	231	95.9
I have not been given advice about exercise by healthcare team	22	9.1	219	90.9



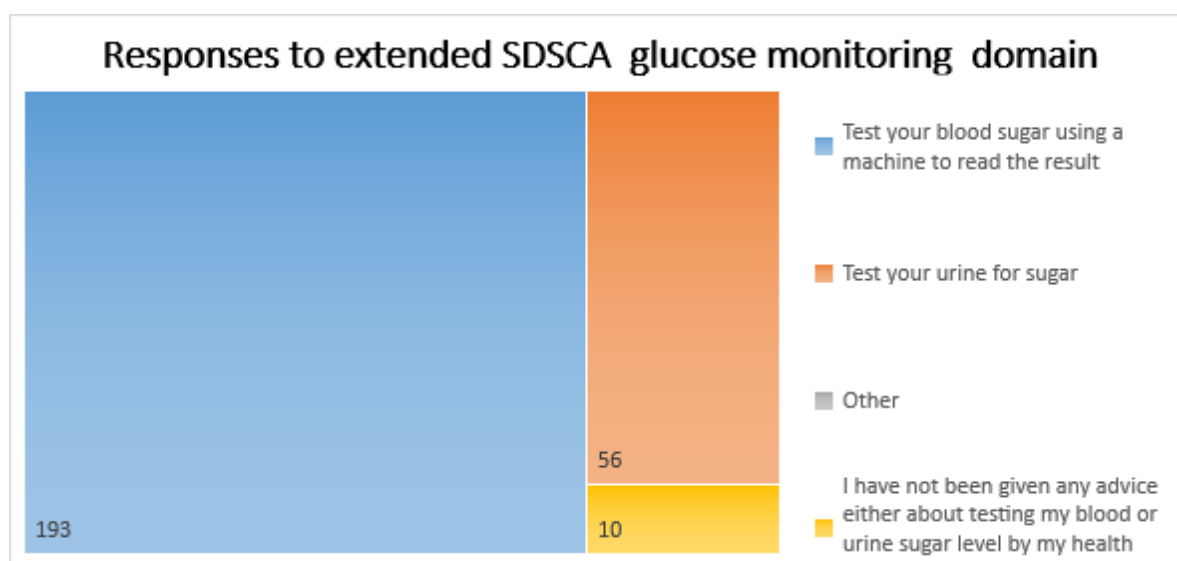
**Figure 6.10: Responses to extended SDSCA exercise subscale**

### 6.5.3 Responses to the Extended SDSCA Survey Blood Sugar Domain

As shown in Table 6.17 and Figure 6.11, the majority of patients ( $n = 193$ , 80.1%) had been told by the healthcare team to test their blood sugar using a machine to read the result. However, only 56 patients (23.2%) had been advised to test their urine for sugar. Overall, 231 patients (95.9%) agreed they had been given advice either about testing blood or urine sugar level by the healthcare team on various occasions.

**Table 6.17: Response to the extended SDSCA survey sugar monitoring domain**

Item	Response			
	Yes		No	
	<i>n</i>	%	<i>n</i>	%
Does the healthcare team advise you to:				
Test your blood sugar using a machine to read the result?	193	80.1	48	19.9
Test your urine for sugar?	56	23.2	185	76.8
Other	0	0	241	100.0
I have not been given any advice either about testing my blood or urine sugar level by my healthcare team	10	4.1	231	95.9



**Figure 6.11: Responses to extended SDSCA glucose monitoring subscale**

#### **6.5.4 Responses to the Extended SDSCA Survey Prescribed Medication Domain**

This domain investigates the medication given to patients by their doctors. As shown in Table 6.18, only 73 patients (30.3%) were given an insulin shot one or two times a day, while 105 patients (43.6%) were given insulin three or more times a day and 69 (28.6%) were given pills to control their blood sugar level. Finally, 11 patients (4.6%) mentioned that they had been prescribed neither insulin nor pills for their diabetes.

**Table 6.18: Responses to the extended SDSCA survey medication domain**

Item	Response			
	Yes		No	
Has your doctor prescribed you:	<i>n</i>	%	<i>n</i>	%
An insulin shot 1 or 2 times a day?	73	30.3	168	69.7
An insulin shot 3 or more times a day?	105	43.6	136	56.4
Diabetes pills to control your blood sugar level?	69	28.6	172	71.4
Other	12	5.0	229	95.0
I have not been prescribed either insulin or pills for my diabetes	11	4.6	230	95.4

## **6.6 Phase 2**

For Phase 2 of this study, data were collected using the DAS-3, as developed by the Michigan Diabetes Research and Training Centre. The DAS-3 can be administered to both patients and healthcare professionals to assess general attitudes towards diabetes. The DAS-3 consists of five domains pertaining to the perception of diabetes and its management: need for special training; seriousness of NIDDM; value of tight glycaemic control; psychosocial impact of DM; and patient autonomy (Al-Maskari et al., 2013). Nurses were asked to indicate their level of agreement with the 33 statements in the instrument based on a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Scores were calculated for each of the domains by summing the score for all questions that



pertain to that domain and dividing that score by the total number of non-missing responses (Figure 6.12). For example, the need for special training domain is calculated by summing scores for all participants for questions 1, 6, 10, 17 and 20 and dividing the sum by the total of the non-missing response for all these questions:

Scale Name	Scale Equation
Need for Special Training	$\sum (Q1, Q6, Q10, Q17, Q20) / \text{Number of non-missing items}$
Seriousness of NIDDM	$\sum (Q2, Q7, Q11, Q15, Q21, Q25, Q31) / \text{Number of non-missing items}$
Value of Tight Control	$\sum (Q3, Q8, Q12, Q16, Q23, Q26, Q28) / \text{Number of non-missing items}$
Psychosocial Impact of DM	$\sum (Q4, Q13, Q18, Q22, Q29, Q33) / \text{Number of non-missing items}$
Patient Autonomy	$\sum (Q5, Q9, Q14, Q19, Q24, Q27, Q30, Q32) / \text{Number of non-missing items}$

**Figure 6.12: Diabetes Attitude Scale-3 formulae**

### 6.6.1 Participants' Demographic Data

Demographic data collected for Phase 2 using the DAS-3 survey included age group, occupation, gender, nationality, years of experience and diabetes training. The results presented in Table 6.19 show that 96.6% of the participants were nurses ( $n = 1,088$ ) and only 3.4% were clinical educators ( $n = 38$ ). The majority of participants were aged 31–40 years ( $n = 452$ , 40%). Most were non-Saudi ( $n = 1,075$ , 95.5%); only 4.5% were from KSA ( $n = 51$ ).

More than half of the participants were female ( $n = 1,062$ , 94.3%) and 5.7% were male ( $n = 64$ ). They varied in terms of experience: 28.5% had 1–5 years ( $n = 321$ ); 37.3% had 6–10 years of experience ( $n = 420$ ); 18% had 11–15 years ( $n = 206$ ); and 11.9% had >15 years' experience ( $n = 206$ ). The majority ( $n = 883$ , 78.4%) had not received any prior diabetes training.

**Table 6.19: Summary of participants' demographic characteristics in Phase 2**

Characteristic		<i>n</i>	%
Occupation	Nurse	1,088	96.6
	Clinical Educator	38	3.4
Age group (years)	19–30	440	39.1
	31–40	452	40.1
	41–61	234	20.8
Gender	Male	64	5.7
	Female	1,062	94.3
Nationality	Saudi	51	4.5
	Non-Saudi	1,075	95.5
Years of experience	1	45	4.0
	1–5	321	28.5
	6–10	420	37.3
	11–15	206	18.3
	>15	134	11.9
Diabetes training	Yes	243	21.6
	No	883	78.4

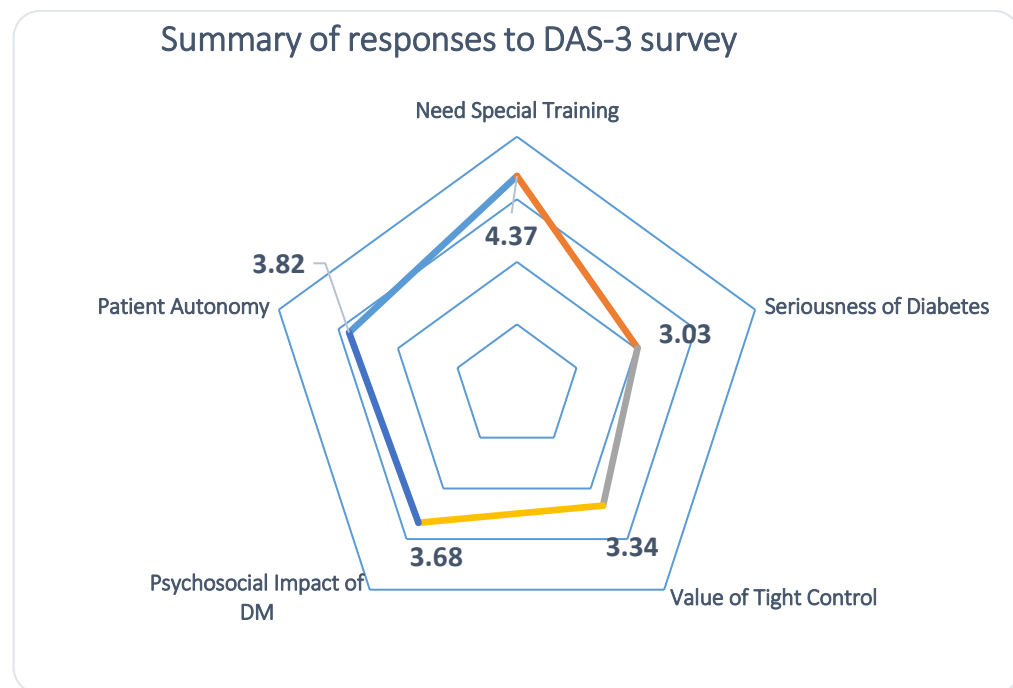
### 6.6.2 Nurses' Perceptions Regarding Care for Type 2 Diabetes Patients

As shown in Table 6.20, there was high agreement among nurses that diabetes educators require special training: the mean agreement score was 4.37, which was very high and indicates strong agreement. The same was noted for the patient autonomy domain where the mean agreement score was 3.8, which indicates that nurses are aware that diabetic patients should participate in planning their own care plans and deciding their own glycaemic goals.

**Table 6.20: Perception score summary for nurses regarding diabetes care**

	Mean	Standard deviation
Need special training	4.37	0.50
Seriousness of diabetes	3.03	0.49
Value of tight control	3.34	0.51
Psychosocial impact of DM	3.68	0.49
Patient autonomy	3.82	0.45

As shown in Figure 6.13, the mean agreement score regarding the psychological impact of DM domain was 3.68, which lies between 3 (neutral) and 4 (agree), indicating a degree of agreement. This shows that nurses are aware of the psychological impact of T2D. However, the seriousness of diabetes domain had a mean value of 3.02, which indicates that there were differing opinions when it came to nurses' perceptions regarding the seriousness of the disease. The same can be said for the value of tight control domain where the mean score was only 3.3. This can be explained by the fact that almost 80% of these nurses did not receive diabetes training, which may lead them to underestimate the value of tight glycaemic control and the seriousness of the disease.

**Figure 6.13: Summary of responses to DAS-3 survey**

## 6.7 Conclusion

The number of diabetic patients that participated in the current survey was 247. They were recruited from the Diabetes Centre at KPMC for Phase 1 to measure patients' diabetes knowledge and to assess their adherence to self-care activities. In addition, 1,126 nurses and clinical educators completed the survey in Phase 2 to explore their perceptions about the care for T2D patients.

Results revealed that most patients had an acceptable level of knowledge regarding T2D ( $n = 91$ , 37%), 36% had a good level of knowledge ( $n = 89$ ) and 27% had a poor level of knowledge.

There was a direct relationship between HbA1c and DKT score, which can be explained by the fact that higher knowledge score is associated with better glycaemic control and thus the lower HbA1c in patients with higher DKT scores.

Diabetes knowledge among patients aged 18–30 was higher than that for patients aged 46–55 and patients older than 55 years of age. Patients aged 31–45 also had a significantly higher DKT mean score than patients aged over 55. This may be due to the fact that the younger generation are more engaged with technology and thus have better access to drug- and counselling-related resources.

Interestingly, diabetic patients with kidney or cardiac problems had a lower level of knowledge than those with eye problems, more than one problem or no problem at all. This may be because patients with poor knowledge regarding T2D and its harmful effects tend to be diagnosed with kidney and cardiac problems due to their lack of awareness about such risks and the silent nature of these problems. The opposite can be noted in patients with no concomitant diseases as these individuals are disease free due to their higher level of knowledge. Moreover, those with more than one disease or with eye diseases have higher DKT scores on average because these individuals tend to learn more about their condition as problems such as eye problems begin to interfere with their daily life activities and force them to learn more about their condition.

Concerning patients' adherence to T2D self-care activity, the results indicated that patients showed the highest adherence to the medication-related activities; adherence to blood and foot care were at an average level. Adherence to diet and exercise-related activities, however, were at a poor level.

Regarding the Phase 2 results, nurses agreed that caring for diabetes patients requires specialised training: agreement was strongest for this domain. Nurses were also aware that diabetic patients should participate in planning their own care plans and deciding their own glycaemic goals, as determined by the patient autonomy domain. Nurses were also well aware of the psychological impact of T2D. However, a problem was revealed in the differing perceptions among nurses regarding the seriousness of diabetes. The same was noted for their perceptions regarding the value of tight glycaemic control. This can be explained by the fact that nearly 80% of these respondents did not receive diabetes training, which may cause them to underestimate the value of tight glycaemic control and the seriousness of the disease.

## **Chapter 7: General Discussion**

### **7.1 Introduction**

This chapter discusses the research results associated with each of the research questions, which are answered by both the quantitative and qualitative components, and examines these findings in relation to the current literature. The research questions seek to identify differences among demographic groups of T2D patients in their diabetes knowledge; assess whether patients adhere to their T2D self-care activities; explore nurses' perceptions in KSA about care for T2D patients; and identify challenges in providing education support for T2D self-management.

For the purposes of this study, a mixed methods approach consisting of three phases was determined to be the most suitable for this study. Phase 1 included a quantitative survey conducted among patients using two quantitative surveys: the DKT and the SDSCA-Arabic. Phase 2 involved a quantitative survey conducted among nurses in KFMC. Phase 3 involved individual, face-to-face interviews conducted using a semi-structured interview guide formed of open-ended questions.

### **7.2 Patient Knowledge of Type 2 Diabetes in the Saudi Population and Demographic Factors Affecting This Knowledge**

The results showed that most participants in the study had an acceptable level of knowledge regarding T2D ( $n = 91$ , 37%). Another 36% had a good degree of knowledge ( $n = 89$ ), and 27% had a poor level of knowledge. The factors that seem to affect the knowledge of diabetes may depend on the country, target population, the methodology, ethnic differences among the population, level of education and so on. While most of the participants in our study had an acceptable level of awareness, only a small fraction (36%) had a degree of knowledge that could be deemed acceptable. This finding is consistent with global results in that most of the population of diabetics is quite deficient in their knowledge about diabetes (Badrudin, Basit, Hydrie & Hakeem, 2002; Jackson et al., 1991; Kamel et al., 1999; Wee, Ho & Li, 2002).

However, only a small number of studies from other region have produced results similar to those presented here. For instance, the current data are consistent with those from a study by Al-Aboudi et al. (2016), which used the same questionnaire in the area of Riyadh, KSA and found that most diabetic patients had moderate knowledge about diabetes. In that study, 72% of the participants had adequate knowledge about diabetes, 13% had good knowledge and 14.7% had poor knowledge about their condition, which is quite similar to the findings here: more participants had a reasonable diabetic knowledge and the smallest percentage was deficient in diabetes knowledge. The similarities may be because both studies used similar designs and carried out research among diabetics. However, the differential scores were quite different. In Al-Aboudi et al.'s (2016) research, 72% of participants had adequate knowledge, compared with values here of 37%; 13% had good knowledge, compared with 36%; and 14.7% had poor knowledge, compared with 27% in the current study. This difference might be explained based on the designs of the two studies. In the current study, those who scored 7–8 on their DKT were placed in the satisfactory category. In Al-Aboudi et al. (2016) research, however, those who scored 7–10 marks were considered to have satisfactory diabetes knowledge. Thus, it is the categories used that explained the differences in results (Al-Aboudi et al., 2016).

Unlike the present study, majority of studies conducted in other areas of KSA have suggested that most diabetics have poor knowledge about their condition and self-care. For example, Abu Hassan et al. (2005) conducted a study to assess diabetes knowledge among Saudi teachers. Their results showed that most participants had highly inadequate knowledge about diabetes. Almost one-third did not know the difference between oral and injectable hypoglycaemic medicines and three-quarters did not know the importance of dietary control and exercise in the management of diabetes. The disparity in results can be explained by the difference in methodologies between two studies. The current study used the Michigan DKT, while Abu Hassan's study used a different questionnaire that focussed more on diabetes complications and self-care, which might explain the difference in results (Abu Hassan et al., 2005).

This lack of knowledge about various aspects of diabetes has been reported in several other studies as well. For example, Al Joudi et al. (2009) examined the level of awareness among

attendees at a primary care centre in eastern Saudi Arabia regarding possible diabetes complications and found that more than 50% of the population was unaware of them. This study used a pre-piloted Arabic instrument and patients were questioned face-to-face, instead of via a distributed self-assessed questionnaire as in the current study. This difference in study methodology might explain the difference in results, as the target population was non-diabetic, unlike the current study population of diabetic individuals. Moreover, the response of patients, when asked a question in an interview style versus having to fill out a questionnaire might be quite different, and this might explain why most patients achieved poor scores in Aljouidia et al.'s (2009) study.

Al Dahan Albaik, Alomran, Aldahan and Albaik (2013) reported similar findings in a study on diabetic patients visiting a healthcare facility in Riyadh, which indicated low levels of awareness regarding different aspects of diabetes. The total score was suboptimal and participants scored on average 60% on the test. The difference in results between Al Dahan et al.'s (2013) study and the current study can be explained, again, on the basis of methodology. The current research used the 23-item Michigan DKT; whereas, Al Dahan's study used a 31-variable self-constructed questionnaire designed to discover diabetes knowledge among participants (Al Dahan et al., 2013).

Mohieldein, Alzohairy and Hasan (2011) confirmed the serious lack of awareness regarding diabetes-related complications among the general public in KSA. The main reason for the difference between that study and the current study is likely the study population. Here, the participants were diabetics and thus more likely to know about their condition; while Mohieldein et al.'s research investigated diabetes knowledge in the general population. However, the results reported by Mohieldein et al. (2011) are consistent with global findings suggesting that the average person has poor knowledge related to diabetes (Deepa et al., 2014).

Comparison of the results from the current study with research conducted in neighbouring regions produces some surprising results. For example, Al-Adsani et al. (2009) conducted a study in Kuwait to assess the level of knowledge among Kuwaiti adults with T2D. The research included 5,114 participants and the researchers used the Michigan DKT to determine the level of knowledge among participants. Results showed that only 6.3% of



individuals scored well on the test, compared with in this study, where 36% had good knowledge about diabetes. Differences in methodology may explain this apparently stark difference. In the Kuwaiti research, only participants who scored greater than 11 on the Michigan DKT were considered to have good knowledge of diabetes (Al-Adsani et al., 2009). In the current study, participants who scored 9 points were considered to have good knowledge about diabetes.

Similarly, researchers evaluated perceptions and knowledge about diabetes among 563 adults in the Omani population who were asked some basic questions related to diabetes. Their knowledge was found to be suboptimal: only 46.5% knew the definition of diabetes and only 21% knew that physical inactivity was a risk factor for diabetes (Al Shafae et al., 2008). This difference with respect to the current study can be explained on the basis of the characteristics of the two study groups. Unlike this study, which was carried out in an urban population, the Omani study was conducted in semi-urban villages. Due to better education and health standards, an urban population is more likely to know about diabetes compared with a rural population. Indeed, research has shown that, on average, urban populations are more knowledgeable about different aspects of diabetes than rural populations (Deepa et al., 2014; Sabri et al., 2007; Muninarayana et al., 2010). Second, Al Shafae et al. (2008) used a self-structured 24-item scale; whereas the Michigan DKT 23-item test was used here.

As expected, in addition to the diabetic population, the level of knowledge among non-diabetics in the neighbouring regions of KSA is not quite satisfactory as well. In one study, non-diabetic individuals from the Ajman and Ras Al Khaimah areas of UAE were surveyed to assess their knowledge related to the basics of diabetes, its complications, treatments, adherence to treatment and so on. The final analysis showed that while knowledge was suboptimal in all categories, it was especially low in the areas of knowledge related to diabetes complications and its management (Hamoudi et al., 2012). This is again consistent with the global findings where the average non-diabetic population has insufficient knowledge about health in general, including diabetes (Deepa et al., 2014).

Only one study was identified from neighbouring regions to KSA that produced results similar to the current study. That study, by Al-Maskari et al. (2013), included 511 randomly

selected diabetic patients from clinics at the Tawam and Al-Ain hospitals in Al-Ain city (UAE). They were asked about their knowledge, attitude and practices related to diabetes. Results showed that 31% of the participants had poor knowledge about diabetes, which is consistent with the current findings. The most likely reason for the similar results is that Al-Maskari et al. (2013) also used a questionnaire based on the Michigan DKT.

Comparing the current results with those in studies from different regions of the world also produces some interesting results. For instance, a Nigerian study conducted by Adejoh (2014) in the area of Igala produced different results, based on 152 diabetic respondents living. Their level of knowledge and diabetes self-care was assessed using a questionnaire based on the DKT and Health Belief Model (HBM) developed by Given, Given, Gallin and Condon (1983); 49% of the participants had a score that could be deemed low in relation to diabetes, and 51% had a score that could be considered satisfactory in relation to diabetes. These findings are markedly different from the current results, which might be explained by ethnic differences, and differences in the methodology of the surveys. Moreover, in the Nigerian study, a significant proportion of the population (29%) was uneducated, compared with in the current study, where most participants had a formal education (Adejoh, 2014). Low level of education is linked with poor knowledge related to diabetes, as discussed further below.

Fenwick et al. (2013) reported similar results from their research conducted in Melbourne (Australia). The study included 181 diabetic participants whose diabetes knowledge was assessed based on the Rasch-derived DKT scale (Bond & Fox, 2001). Around 61% of the participants had poor scores related to diabetes knowledge, which is a much higher percentage than in the current study, but may be due to the difference in scales used for the assessment of diabetes knowledge. Unlike the current study, the Australian study used the Adapted Michigan Diabetes Research and Training Centre Brief Diabetes Knowledge Test for evaluation of patient knowledge (Fenwick et al., 2013). Finally, a previous study conducted on Chinese adults with diabetes revealed significant diabetes knowledge deficiencies (Hu, Gruber, Liu, Zhao & Garcia, 2013). This was consistent with research conducted by Murata et al. (2003), which confirmed poor performance on the diabetes knowledge test among the diabetic population (Murata et al., 2003).

In contrast with these other studies, a Malaysian study (Al-Qazaz, Hassali, Shafie, Sulaiman & Sundram, 2010) produced results consistent with the current study. It included 307 outpatient diabetics who were assessed for their knowledge about diabetes and found that 37.6% of participants had a low level of diabetes knowledge. This fraction is quite similar to the current study, which might be due to similar research modalities: both studies used the Michigan DKT. Nonetheless, there were slight differences between results that might be due to regional and ethnic differences. Moreover, a significant proportion of Al-Qazaz et al.'s (2010) study participants had a low socioeconomic background (80%) compared with the 44% participants in the current study that had a (low) monthly income less than SAR5,000. Also, a significant proportion of the population was unemployed (33%). Low socioeconomic status and low unemployment are linked with adverse diabetes outcomes and limited knowledge about the condition (Al-Eidi et al., 2016).

The current results showed that there was a statistically significant difference in the DKT scores across the various education levels ( $F(4,242) = 6.0, p < 0.001$ ). In fact, this study found that the more educated participants had a higher level of diabetes knowledge: nearly half of the participants had a bachelor degree ( $n = 103, 41.7\%$ ) and 2.4% had a postgraduate degree ( $n = 6, 2.4\%$ ). This finding is consistent with Al-Aboudi et al. (2016) who found that the educational status of the patient had a deep link with their knowledge about diabetes. An association between degree of education and level of knowledge about different health conditions, including diabetes, has been consistently reported in research conducted in KSA and elsewhere. For example, Taha and Bella (1998) conducted a study in eastern KSA to explore knowledge about causes and prevention of CHD among patients in healthcare settings. They found that the level of knowledge related to CHD was closely linked to the degree of education of the participants. Similar findings have been reported in neighbouring Arab countries as well. For instance, Al Shafae et al. (2008) showed that poor educational status in Oman was a risk factor for low levels of knowledge about diabetes, its complications and management. Similarly, Mosca, Ferris, Fabunmi, Robertson and American Heart Association (2004) and Potvin, Richards and Edwards (1999) found similar associations between the education status and degree of knowledge about heart disease among the Canadian population (Mosca et al., 2004; Potvin et al., 1999). The React Survey, intended to explore the association between education and knowledge about

cardiovascular disease, revealed a similar association (Erhardt & Hobbs, 2002). The survey included 5,104 members of the general population from five European countries (the UK, Sweden, France, Italy and Germany) (Erhardt & Hobbs, 2002). Also, Rafique and Khuwaja (2003) shed some light on this connection from a developing country's perspective. Their study investigated knowledge among the general Pakistani population related to the relation between lifestyle, diabetes and hypertension. These results, again, showed that the degree of health knowledge corresponds to educational status (Rafique & Khuwaja, 2003).

The current research revealed a significant difference between the DKT scores of patients and their HbA1c levels. This association can be explained by the fact that higher knowledge scores indicate better understanding among patients about their condition and its management. Therefore, a higher score on the DKT is associated with better glycaemic control and, as a result, lower HbA1c levels. This finding is similar to the results of studies conducted in other parts of KSA and elsewhere. For example, the results were consistent with a study conducted by Almalki (2017) in Tabuk, KSA, where most participants had poor glycaemic control as shown by high Hb1Ac levels, which corresponded to the levels of education of the participants (Almalki, 2017). The current findings are consistent with studies in other parts of the Middle East as well. Al-Adsani et al. (2009) reported a similar relationship between knowledge and diabetes control, as did Al-Maskari et al. (2013) in their study population in the UAE. A similar association between a high score on the DKT and Hb1Ac has been reported in studies conducted in other parts of the world, such as Australia (Fenwick et al., 2013) and Sweden (Herenda, Tahirović & Poljaković, 2007).

There was a significant difference in DKT scores across age groups in the current study: middle-aged people scored better on their DKT than older individuals. This may be due to middle-aged people being more mature than younger people, but also more resourceful than older ones and thus more likely to know about their condition compared with individuals of other age groups. These findings are consistent with other studies conducted in KSA, in surrounding regions and throughout the world. Mohieldein et al. (2011) reported similar findings: the DKT scores of participants in their 30s and 40s were higher than those of younger and older individuals. Similarly, the Kuwaiti study by Al-Adsani et al. (2009) produced similar results: middle-aged individuals (less than 50 years old) had better DKT

scores than the more elderly population. Further, an Indian study showed that old age was a risk factor for poor knowledge about diabetes (Chavan et al., 2015). Khan et al. (2011) also linked younger age with an increased chance of having good knowledge related to risk factors for CHD. Similar research findings have been reported in Australian studies also (Kilkenny et al., 2017). However, other relevant studies have found no significant relationship between the age of respondents and their knowledge about their health condition (Akintunde et al., 2014).

Interestingly, diabetic patients with kidney or cardiac problems had a lower level of knowledge than those with eye problems, more than one problem or no problem at all. This is consistent with previous research findings where both diabetics and non-diabetics with cardiac and renal issues have limited knowledge about diabetes (Gautam et al., 2015; Roomizadeh et al., 2014). However, the current study appears to be unique in showing that having eye-related complications or multiple diabetes complications is linked to better scores on the DKT.

### **7.3 Patients' Adherence to Type 2 Diabetes Self-care Activities**

The results from the present study indicate that T2D patients are highly committed to taking their medication ( $M = 6.13$ ,  $SD = 1.25$ ). The results for foot care ( $M = 3.28$ ,  $SD = 1.69$ ) and blood monitoring ( $M = 4.15$ ,  $SD = 2.42$ ) were average compared with diet and exercise-related behaviour, where the values were  $M = 2.57$ ,  $SD = 1.7$  and  $M = 2.13$ ,  $SD = 2.0$  respectively, implying low adherence to diet and foot care.

With regard to advice given for dietary intake, the present study found that 74.3% of patients were advised to follow a low-fat eating plan and 41.5% were advised to follow a complex carbohydrate diet. The percentage of patients who were advised to reduce their calorie intake with the aim of losing weight was 42.7%. The percentage of T2D patients in the present study who were advised to eat a diet rich in dietary fibre was 48%; 38% were advised to eat at least five servings of fruit and vegetables on a daily basis; and 45% reported being advised to eat very few sweets.

The other major findings were that 66.8% of respondents were advised by their doctors to do low-level exercise such as walking on a daily basis and 42.7% were advised to exercise continuously for at least 20 minutes three times a week. The percentage of respondents that were advised to integrate exercise in their daily routine, such as taking stairs rather than elevators, was 37.3%. Only 13% of respondents reported that they engaged in a specific type, amount and duration of exercise. As with the other self-management activities, the questions about exercise revealed that most patients had received advice on exercise.

The current study also indicated that 80.1% of respondents were advised by their HCPs to monitor their blood sugar level using a machine. The percentage of respondents advised to check their blood sugar level using a urine test was 23.2%. Most respondents reported having been advised by their healthcare team to monitor their blood sugar levels either through a urine test or via machines.

Most patients in the current study (95.4%) reported that their doctors had advised them about using pills or insulin to help manage their blood sugar levels. Around one-quarter (28.6%) were advised about using oral pharmacological medications for management of diabetes. The percentage of patients advised to use insulin shots more than three times per day was 43%; 30.3% were advised to use shots one or two times per day.

Regardless of the advice provided, the research findings indicate that people with diabetes do not comply with all the self-management activities that they are required to perform, despite being advised to do so by their HCPs. For instance, despite respondents admitting having been advised by their doctors to eat very few sweets, follow complex carbohydrates diet, cut down on their fat and refined carbohydrate intake and eat fruit and vegetables, only  $M = 2.57$ ,  $SD = 1.73$  of patients complied. This means indicate that the advice provided to patient is followed by a small minority Patients perceive doctors' role as mainly that of providing medication for treatment of patients. Patients are therefore more likely to follow a doctor's advice on medication than on lifestyle changes. Given that the leading causes of complications related to T2D include a failure to adhere to a strict diet and exercise regimen, in addition to adhering to prescribed medication (Sharaf, Midhet & Al-Mohaimed, 2012), it is likely that patients in this study will suffer many complications.

The findings from the research are important because they help to understand why T2D patients continue to suffer from complications despite many recommendations. The findings also help in identifying the level of effectiveness of doctor–patient communication in promoting lifestyle change and adherence to medication. According to Ha and Longnecker (2010), it is important that doctors effectively communicate with their patients to ensure total adherence to medication and lifestyle changes. However, given that the findings from the present research show that patients do not comply with self-management, it is possible that such communication is ineffective. The other significant aspect of this study is that it can be used to identify self-management practices that should be prioritised with an aim to ensure patients adhere to the practice. The research also identifies those practices that only need reinforcement because the level of adherence is high.

This finding is similar to that in a study by Abu Sabbah and Al Shehri (2014), who found that the level of compliance to diet, exercise and foot care was poor compared with compliance to medication, which was 94.7%. The results are also similar to those reported by Sweileh et al. (2005) for Northern Palestine where the rate of non-compliance among T2D patients was 6.5% (52.4% had partial compliance and 42% had good compliance). Li et al. (2014) also found that foot care among T2D patients was poor and that there was a need for patients to attend periodic inspections. Doctors should also provide more information to their patients regarding foot care activities to promote positive behaviour change.

According to Sharaf et al. (2012), research has shown that Saudi Arabian diabetic patients fail to take precautions on matters regarding exercise and diet. In that study, only 2.2% of patients always complied with the required diet while 92.1% of patients only occasionally followed the diet. The researchers also made reference to a study indicating that 77.7% of diabetic patients in Egypt have poor adherence to a favourable diet. This is despite the fact that the research found that most physicians in Egypt provide advice about exercise and diet (Mahfouz & Awadalla, 2011).

With regard to compliance with exercise, Sharaf et al. 2012 reported similar results to the current study in that there was very low compliance with exercise for diabetic patients. In their study, the percentage of patients that exercised three to seven times per week was only

32.3. Studies have shown that the level of adherence to exercise among diabetic patients in US is only 19% (Delamater, 2006): in that study only 39% of patients with T1DM and 37% of patients with T2D adhered to exercise routines. The patients who adhered poorly to medication were more likely to have poor adherence to exercise during the summer. Around half of the patients with high medication adherence, 39.8% of those who moderately adhere to medication and 88.2% of patients with low medication adherence found it difficult to exercise in summer when the weather was hot (Mohd et al., 2016).

The prevalence of foot ulcers in a study by Pollock, Unwin and Connolly (2004) which was conducted in Middlesbrough, South Tees, UK was 1.5%. In the same study, 50% of patients were not aware that they could be injured in the leg and not notice or feel the pain. Patients with higher knowledge about foot care were more likely to state that they had received doctors' advice for foot care (Aljohani, Kendall & Snider, 2015).

Mahfouz and Awadalla (2011) reported that levels of blood monitoring among illiterate and people and university students with diabetes in rural El-mina in Egypt were 55.5% and 56.3% respectively. These results are contrary to the findings of most studies because educational achievement mostly relates to high adherence. The reasons for the contrary result is however not clear. Al-Akour, Khader and Alaoui (2011) indicated that 51.6% of patients with T2D had poor glycaemic control. People who have had T2D for periods exceeding 10 years have a higher incidence of poor glycaemic control (56.3%) compared with individuals who have had T2D for a shorter duration, for whom the rate of poor glycaemic control was 46.5% Al-Akour et al. (2011). Factors such as level of education, Body Mass Index, age and employment factors did not affect the rate of poor glycaemic control. Kheir, Greer, Yousif, Al Geed and Al Okkah (2011) reported that the psychological state of a diabetic patient is also positively associated with their level of knowledge regarding self-management.

In contrast, Delamater (2006) found that in one study that used a national sample of T2D patients, 80% of patients being treated by exercise and diet, 65% on oral medication and 24% being treated with insulin did not monitor their blood glucose level daily. In yet another cross-national study conducted in UK on T2D patients, patient adherence to SMBG was 70% among T2D patients and 64% among T1D patients (Jordan & Jordan, 2010).



Many studies have shown that only 15–70% of T2D patients engage in the recommended exercise, which requires exercising continuously for at least 20 minutes on a minimum of three occasions per week.

Although adherence to medication is relatively good in general, various factors determine the rate of medication adherence for diabetic patients. According to Mohd et al. (2016), some predictors of medication adherence among diabetic patients in UAE were insulin use, age and ethnicity, the presence of a chronic condition, gender and academic attainment. Similarly, sociodemographic features that influenced strong adherence among Kuwaitis included being female (51.6%). Adherence among non-Kuwaitis was higher (57.2%, than for the Kuwait nationality (Al-Majed, Ismael, Al-Khatlan & El-Shazly, 2014)

Educational attainment can also affect the rate at which patients follow the advice given to them by doctors (Kheir et al., 2011). Patients who had not completed their primary school education had a higher adherence (60.2%) than patients with primary or intermediate education, whose rate of adherence was 13.5%. Adherence was even lower for secondary and university graduates, at 10% and 16.4% respectively. Jobless patients in Kuwait had a higher adherence (57.4%) than employed patients (42.6%). This suggests that patients with low academic qualifications are more likely to follow doctors' advice because they perceive doctors as knowledgeable. However, patients with higher educational attainment do not follow their doctor's advice because they tend to think that doctors are professionals just as they are, and do not respect them greatly.

Al-Majed et al. (2014) reported a significant difference regarding marital status: married patients scored 92.6% in adherence compared with the 7.4% score for unmarried patients. High adherence among married people can be explained by couples reminding each other to follow the doctors' advice. Also they may feel more responsible to ensure that they adhere to health than a single person. The adherence rate for people living in villa housing (people with high income) was 2.1%, compared with 39.5% for people in middle-income housing, 17.6% for those in limited income housing and 40% for those living in apartments (Al-Majed et al., 2014).

The results from self-reporting on medication adherence from the study by Mohd et al. (2016) in UAE indicates females had a higher adherence rate (51.6%) than men (48.4%). Regarding ethnicity, Arab Emirati (an ethnic group in UAE) had high adherence (56.1%), followed by non-Emirati Arabs (38.1%) and finally Asians, who had a medication adherence rate of 5.8%. Regarding insulin use, patients who used insulin had a higher medication adherence rate (50.2%) than non-insulin users, who had an adherence rate of 49.8%. Finally, diabetes patients who had additional chronic conditions showed greater medication adherence (54%) than those without chronic conditions, whose adherence was 46.0%. Half the patients with chronic illnesses including diabetes had regimen adherence problems (Delamater, 2006). Of T2D patients in the UAE, 64.6% failed to adhere to all self-management practices (Mohd et al. 2016).

In Kuwait, the non-adherence rate is surprisingly low, with only 26.1% of T2D patients did not adhering to medication and making lifestyle changes (Al-Majed et al., 2014). Also, Mohd et al. (2016) found that the mortality rate due to diabetes is higher among non-adherent than adherent T2D patients. However, Khan et al. (2011) found that among patients in the Al Hasa region of KSA, the adherence rate was low; hence, the researchers recommended improvements in the healthcare system, education and health training for people with diabetes.

Of 533 respondents in one study in KSA, 51.6% had poor glycaemic control (Al-Akour et al., 2011). In the same survey, poorer glycaemic control was evident among patients who had T2D for more than 10 years (56.3%) than among patients who had the disease for less than 10 years (46.5%). In two separate US datasets (one from a national health survey and the other from a nutrition examination survey), 42% and 50% of T2D patients respectively had poor glycaemic control (Salam & Siddiqui, 2013). In the United Kingdom, two retrospective studies, in 1998 and 2002, showed that 79% and 76% of T2D patients respectively did not have adequate glycaemic control (Al-Akour et al., 2011).

It is possible that the patients' adherence to medication is not determined by the advice given to them by their doctors. There may be variables other than the effectiveness of communication that makes patients either more willing to adhere to self-management practices or to fail to adhere to self-management practices. For instance, other predictors of

high adherence to self-management in Hulu Langat District include the behavior of include stopping following the guidance of doctors during the Ramadhan period; and patients being weight conscious (Ahmad, Islahudin & Paraidathathu, 2014). Non-adherence was high among patients who followed a traditional Arabic dress code (Salam & Siddiqui, 2013) in Saudi Arabia.

According to Elzubier et al.'s (1996) study in Saudi Arabia, the strongest predictor of medication adherence was having high educational attainment (more than college). Other predictors of medication adherence included stopping medication during Ramadhan; being of more advanced age; being Asian or non-Emirati; and a longer duration since diagnosis (Mohd et al., 2016). Patient factors that led to non-adherence included non-adherence to the recommended diet, irregular follow-up visits, irregular exercise and smoking (Kassahun, Eshetie & Gesesew, 2016). These factors may affect the effectiveness of communication when doctors are offering advice pertaining to self-management practices (Aljohani et al., 2015). Also, according to research by Xu et al. (2010) among Chinese American T2D patients, cultural factors can perturb doctor–patient communication, resulting in poor adherence to advice.

According to Mahfouz and Awadalla (2011) in Egypt, the age of patients influences the adherence to self-management activities. In their study, people between 60 and 70 years of age had lower rates of monitoring their blood sugar frequently (21.4%). A higher adherence of 25% was found in patients below the age of 60, and moderate adherence to frequency of monitoring of blood glucose level was found in patients over 70 years. The study also found no significant difference in blood glucose monitoring between males (26.8%) and females (25%). Further, more than half of the respondents with low literacy levels (55.5%) monitored their blood sugar levels frequently, while more than half of respondents with a university degree (56.3%) never monitored their blood sugar levels. People in most occupations including administrators, non-workers, farmers and manual workers monitored their blood glucose less frequently compared to people who were not working (Mahfouz & Awadalla, 2011).

## **7.4 Nurses' Perceptions in Saudi Arabia About Care for Type 2 Diabetes Patients**

Attitudes of HCPs, and nurses in particular, towards diabetes is important as nurses are the first point of contact for patients with diabetes. Several studies have assessed the attitudes of HCPs towards diabetes and how they perceive different aspects of that disease. An examination of the literature identified many studies that were performed in the US, Europe, South America and Asia to assess the attitudes of physicians, pharmacists and nurses towards diabetes, as their attitudes play an important role in how they communicate with patients to provide healthcare. A few studies were also identified that were conducted in Gulf countries such as UAE, other Arab countries such as Yemen, and countries in Africa including Nigeria and South Africa. The current study adds new information to the existing literature about how HCPs (nurses in particular) perceive diabetes and its seriousness in KSA. However, it can be difficult to compare these results with those reported in the literature due to the variation in methodology and time used between studies. For example, this study used the DAS-3 survey to assess attitudes towards diabetes. Other researchers have used scenario-based situations, questionnaires developed for the purpose of their studies or scales other than the DAS-3 (Donnelly & Anderson, 1990; Lou et al., 2014). Moreover, not all studies included HCPs from diabetes care centres. Some included HCPs in intensive care units and others included HCPs in primary, secondary and tertiary care units. Further, some studies included diabetes specialists whereas others included endocrinologists or dietitians (Babelgaith et al., 2013; Bani-Issa, Eldeirawi, Al Tawil & Bani-Issa, 2015).

**Table 7.1: DAS-3 subscale mean results in several countries including in the current study**

	KSA	UAE	Yemen	Nigeria
Need special training	4.4	4.4	4.2	4.4
Patient autonomy	3.8	3.6	3.3	3.5
Psychosocial impact of DM	3.7	3.88	3.4	3.33
Value of tight control	3.4	3.51	3.4	2.95
Seriousness of diabetes	3.0	3.8	2.6	3.17

*Source.* Babelgaith et al. (2013); Bani-Issa et al. (2015); Odili and Oparah (2012)

The majority of nurses included in the current study (78.4%) had not received diabetes training. The number of nurses that had received diabetes training was less than that reported in the UAE where more than half of the nurses included in the study by Bani-Issa et al. (2015) had received diabetes training, compared with only 24.6% in our study. Moreover, 36.0% of the UAE nurses had received diabetes certification. The educational level of nurses is an important factor that affects how HCPs perceive diseases such as T2D. Bani-Issa and co-workers (2015) used DAS-3 scores to assess the attitudes of HCPs in their study, as was done here. On the need for special training, the average score in this study was similar to that reported by Bani-Issa et al. (2015) ( $M = 4.4$ ). This score was the highest in both studies: Bani-Issa et al. (2015) found that the highest mean attitude score was on the need for special training (4.5 in HCP and 4.4 in nurses). These results highlight the great need for special training expressed by nurses regardless of their knowledge level. Although more nurses in the current study had not received diabetes training compared with the UAE nurses, the need for special training was the highest scoring scale in both studies. This indicates that nurses in both KSA and other Gulf countries like UAE understand their own shortfalls in handling problems associated with diabetes and its management.

Comparing other scales of the DAS-3 between the two studies, several significant differences were found. The score for patient autonomy in the current study was higher than that reported by Bani-Issa et al. (2015) (3.8 vs. 3.6). This shows that nurses in KSA

understand well that patients have the right to participate in the formulation of their care plan and have a positive attitude towards patient autonomy, which ranked second with respect to score ( $M = 3.82$ ). This finding suggests that nurses believe that diabetics should participate in formulating their own care plan and contribute to decisions concerned with their self-management.

The main surprising finding was that the attitude score for the seriousness of diabetes in the current study was low ( $M = 3.02$ ) compared with results from other countries. For example, the study performed in the UAE reported overall  $M = 3.8$  for HCP and nurses. This indicates that the attitude towards the seriousness of diabetes is low in the current sample, which may negatively affect how nurses communicate with diabetic patients. This difference with respect to the UAE study may be explained by the fact that 50% of the nurses in the UAE study had received diabetes training and almost 18% had diabetes certification (Bani-Issa et al., 2015). These numbers are higher than the numbers reported in the current study where only 21.6% of nurses had received diabetes training. These results indicate that diabetes training and certification may be important in KSA to raise awareness among HCPs regarding the seriousness of T2D diabetes and that continuing education programs are necessary to achieve such outcomes.

Other differences were noted between the two studies. Bani-Issa et al. (2015) included a smaller number of nurses compared with the current study, although they came from multiple centres across the UAE unlike the current sample, which came from a single medical centre. Also, the sample reported by Bani-Issa et al. (2015) came from primary care centres and not from a specialised centre for diabetes care.

Regarding attitudes towards the psychological impact of DM, the value of tight glycaemic control and patient autonomy, results from the current sample did not differ significantly from those reported for UAE nurses.

Comparing the current results with those in a study in Yemen by Babelgaith et al. (2013), an interesting finding was that the majority of nurses included in the Yemeni sample were males, whereas the sample in the current study consisted mainly of females. Also, the final number of Yemeni nurses was very small ( $n = 17$ ). Nonetheless, there was good agreement

between the results of the two studies. For example, the need for special training ranked first in Yemen, with a score of 4.2, which concords with the results here. Moreover, attitudes towards the seriousness of diabetes and the value of tight glycaemic control were similar in the two studies. However, the attitude scores towards the psychological impact of diabetes and patient autonomy were higher in the current study. However, Babelgaith et al. (2013) did not report the percentage of their Yemeni HCPs (nurses) that had received diabetes training or certification. They also mentioned that many nurses refused to complete the survey, which may have caused the results to be biased.

With respect to countries in Africa, Odili and Oparah (2012) carried out similar research in Benin city in Nigeria to explore the attitudes of nurses, pharmacists and physicians towards diabetes care. They included 257 nurses and used the same DAS-3 scale used here. They reported a large range of opinions among nurses, physicians and pharmacists when it came to their attitude towards diabetes. For example, physicians had a significantly higher mean attitude score towards the seriousness of T2D. Nurses had a similar attitude towards the seriousness of diabetes ( $M = 3.17$ ) as that reported in the current study ( $M = 3.0$ ). Likewise, they reported that the attitude score towards the need for special training was high, similar to the current study. This further confirms that nurses are aware of their relative lack of knowledge when it comes to communicating and dealing with diabetic patients (Odili & Oparah, 2012).

Odili and Oparah (2012) also stated that the Nigerian nurses least valued the seriousness of diabetes and had the least favourable score towards diabetes, scoring lower than physicians and pharmacists. This can be explained by the fact that physicians and pharmacists are more knowledgeable about diabetes care and management than nurses. Patient autonomy ranked second (Odili & Oparah, 2012), similar to the current results. This suggests that nurses understand the right of the patients to participate in formulating their own care plan. This is unlike physicians, who least valued patients' autonomy; they may perceive themselves to be the only ones qualified enough when it comes to formulating an appropriate care plan for their patients.

Van Zyl and Rheeder (2008) examined the attitudes of medical and nursing staff at Kalafong Hospital in South Africa and found that although HCPs had average to poor

knowledge about the care for diabetes, they had positive attitudes towards diabetic patients and understood that special training in diabetes is necessary. However, scores were reported as medians and interquartile ranges for 61 nurses, which makes it inappropriate to compare their results with others. Nonetheless, van Zyl and Rheeder (2008) confirmed that the need for special training was the highest scoring domain among the five domains assessed by the DAS-3. None of the scales scored below 3.5, which indicates high awareness regarding diabetes. Patient autonomy scored 3.75 and the psychological impact of diabetes mean score was 3.67. As previously stated, medians were used instead of means, which may have affected the results.

In Argentina, Gagliardino, González and Caporale (2007) assessed the attitudes of various HCPs such as physicians, dietitians and nurses towards diabetes. They included 50 nurses and found that attitudes towards diabetes did not differ between physicians, pharmacists and nurses. However, attitudes were significantly different between the public and prepaid sectors: HCPs from the public sector had lower scores than those from the prepaid sector. A striking finding was that neither HCPs nor people with diabetes considered patient autonomy an important issue, scoring a mean of 2.79 for this subscale, which is even lower than the result in the current study (Gagliardino et al., 2007).

In the US, Anderson and co-workers reported the attitudes of HCPs using the revised DAS survey in a study published in 1992 (Anderson et al., 1993) and not the DAS-3, which was published in 1998. Anderson et al. (1998) was one of the earliest studies to report on the attitudes of HCPs towards diabetes. The authors reported the results for seven subscales in the revised DAS, which complicates result comparison. Nonetheless, some scales did not change across versions. For example, the need for special training was the scale that received the highest degree of agreement among HCPs in the Anderson et al. (1998) study. Nurses at the University of Michigan Hospital's Diabetes Clinic, the site of the study, were aware of the seriousness of diabetes, as indicated by a mean score of 3.60, higher than the mean score of 3.00 recorded in the current study. However, care must be taken when interpreting and comparing between studies, as the revised DAS scale differs from the DAS-3 scale used in the current study.



These previous findings show that there is great heterogeneity among nurses in various countries with respect to their attitude towards diabetes. This may influence the quality of care provided to patients if measures are not taken to overcome such a problem. Variability may also arise due to difference in methodologies as well as the level of education and the area in which the study was conducted. For example, urban populations are generally more knowledgeable than rural populations, which can cause the mean score to be higher in urban populations.

Nurses in the current study believed strongly that there was a need for special diabetes training to care for patients with diabetes; this implies that they understand the complexity of diabetes as a disease and are aware of their inadequacies in handling the various clinical, humanistic and economic issues associated with its management. As previously mentioned, this accords with the published literature as nearly all studies that have assessed attitudes towards diabetes have highlighted the importance of diabetes special training.

With respect to attitudes towards the psychological aspects of diabetes, the mean attitude score here was 3.69, which is lower than the score reported for Nigeria ( $M = 4.07$ ) (Odili & Oparah, 2012) but similar to that for Yemen ( $M = 3.70$ ) (Babelgaith et al., 2013). These results were expected as most health care professionals related to diabetes focus on clinical guidelines, pathophysiological, biological, psychosocial aspects and treatments to prevent late macrovascular and microvascular complications of diabetes.

Unlike in other studies (Babelgaith et al., 2013; Gagliardino et al., 2007; Odili & Oparah, 2012), the autonomy subscale here was not the lowest of all the attitude subscales. This may be because the majority of nurses in the current study had not received appropriate training regarding diabetes. Thus, seriousness of diabetes was the lowest of all domains in the current study.

These results are also consistent with those from a previous study (Fitzgerald et al., 2008) in which the authors explained this finding by the fact that nurses are more committed to helping patients through their supportive role. Nurses here also valued patients' involvement in their care-related decisions. Although the current study did not assess the attitude of physicians, in Bani-Issa et al. (2015), the patient autonomy score for physicians

( $M = 3.3$ ) was lower than that reported for nurses in the current study. This may be attributed to the fact that physicians view themselves as the ones who should make decisions for patients (Anderson et al., 1991; Odili & Oparah, 2012). HCP attitudes towards patient autonomy are important; Hajos et al. (2011) reported that patients from eight countries (France, Germany, the UK, Italy, the Netherlands, Spain, Sweden and the US) were always looking to contribute to decisions pertaining to their health. They also highlighted the importance of shared decision making as well as the enhanced patient–HCP communication that is the basis for shared responsibility.

Overall, the high score reported for this domain in the current study is promising because support for patient autonomy, involving the patients in their care plan and collaborating with HCPs is a strong predictor of patient-reported outcomes. This was reported by the worldwide *Diabetes, Attitudes, Wishes and Needs* study that included a large number of T2D patients (Peyrot et al., 2005).

Regarding the value of tight glycaemic control, the mean score was 3.33 in the current study, which is slightly lower than those in the literature (Babelgaith et al., 2013; Bani-Issa et al., 2015). As tight glycaemic control is very important to prevent diabetes complications, the attitudes of HCPs towards tight glycaemic control should be improved to ensure proper management of the disease (Mannucci, Dicembrini, Lauria & Pozzilli, 2013). The scores in the current study were higher than those reported in Nigeria, which indicates that nurses in KSA value the importance of tight diabetes control and its benefits in preventing diabetes complications.

One important aspect of the current study was that the number of nurses included was large compared with the number of nurses recruited in other studies (e.g. Bani-Issa et al., 2015; Gagliardino et al., 2007). This ensures that the results are reliable and provides a good estimate of the attitudes regarding diabetes among Saudi nurses, who were the main focus of the study. This is important as nurses play an important role as providers of care in hospitals and are in direct contact with diabetic patients. Thus, their attitudes towards diabetes and diabetes management are important to ensure provision of optimal healthcare to diabetic patients.

One proposed solution to improve the attitudes of HCPs towards diabetes is through continuing education programs. Indeed, such programs have been shown to improve the attitude of HCPs towards diabetes. Sharp and Lipsky (2002) demonstrated this fact by studying the effect of a seven-hour continuing medical education (CME) program on attitudes towards diabetes. Following the CME program, physicians had significantly more positive attitudes on two of five DAS subscales. At 3 months, this change persisted on one subscale that measured beliefs related to T2D being a serious disease (Sharp & Lipsky, 2002). One might argue that just seven hours of CME may not be sufficient to permanently change attitudes of HCPs towards diabetes. Indeed, training programs should be implemented at regular intervals to ensure that HCPs are up to date with knowledge regarding diabetes and to improve the attitudes of HCPs towards diabetes.

## **7.5 Challenges of Providing Self-management Education Support to Patients With Type 2 Diabetes**

This section discusses in detail the themes that relate to the challenges that healthcare teams in KSA face when offering self-management education to T2D patients. In the study, the challenges were grouped broadly as cultural and communication challenges. These are the two major challenges that hinder the effectiveness of self-management education support for T2D patients. With respect to cultural challenges, the researcher focussed on misconceptions, a sedentary lifestyle and food habits. In contrast, the researcher focussed on language and engagement to determine how communication challenges influence self-management education support for patients with T2D.

### **7.5.1 Cultural Challenges**

Cultural factors were often discussed as a major obstacle to patients' self-management behaviour. For example, the participants in the study recognised that lack of knowledge among the people of KSA is one of the significant challenges that hinders self-management education support of people with T2D. Several studies have documented how knowledge influences the administration of self-management education support. Abahussain and ElZubier (2005) noted that Saudi Arabians face increasing incidences of T2D as well as other health complications such as heart disease, stroke, kidney disease and nervous system

disease due to lack of knowledge of its causes and implications. This idea was supported by Mohieldein et al. (2011) who suggested that lack of knowledge on the causes and symptoms of T2D among the KSA population limits possibilities for combating the condition until it worsens to a life-threatening condition.

In this regard, Al Shafae et al. (2008) recommended that health professionals and policymakers should be cautious when alerting the public on how to manage diabetes. Mohieldein et al. (2011) concluded that health professionals and policymakers should be heavily involved in providing knowledge to diabetic patients, their families and the public.

Another subtheme that this study revealed was over-reliance on traditional herbs without medical consultation. Most participants said that a great number of Saudi Arabian families rely on traditional herbs as their first medication. In support of this, Hu et al. (2013) and Adejoh (2014) in their studies of diabetes in China and Nigeria respectively discovered that visits to herbal doctors for diabetes treatment or to ophthalmologists are preferred among residents in these countries over seeking treatment from health professionals.

Many participants felt that ‘sedentary lifestyles’ and ‘laziness’ pose major barriers to providing care for people with T2D in KSA. Another reason the local community is considered to have a sedentary lifestyle is that some people have hired domestic help such as housemaids, nannies and drivers to help with their daily tasks. This was also discussed by Al-Hazaa, Abahussain, Al-Sobayel, Qahwaji and Musaiger (2011), who reported a high prevalence of sedentary behaviours and physical inactivity among Saudi adolescents.

Participants here believed that parties and social occasions presented an obstacle because many people feel hesitant to ask for healthier food options for fear of offending their hosts. This represents a major barrier for patients who do put a lot of effort into managing their diet, as they may feel pressured to consume food that is unhealthy for them. Musaiger (2011) found that over the previous four decades, food consumption patterns and dietary habits had increased notably in the Eastern Mediterranean region. Therefore, people have little freedom to choose what they consume at parties and social events.

Women's need for a companion and transport is believed by participants to be key hindrances to self-management education support in T2D. Some women are unable to participate in physical activity in the absence of people to accompany them to public exercise venues. The findings in the current study agree with those reported by Al-Eisa and Al-Sobayel (2011), who pointed out that social norms in KSA restrict opportunities for girls and women to participate in physical activity. The participants further noted that women are restricted by these social norms and are unable to break away from them. In turn, this limits the ability of the healthcare teams to effectively employ self-management education support for T2D.

The participants also pointed out that because women are not allowed to drive themselves, they are assigned male drivers. That Saudi women are not allowed to drive was also noted by Alshaikh, Filippidis, Baldove, Majeed and Rawaf (2016). Further, the participants pointed out that the Saudi education system does not allow education on physical exercise among girls, a concept that was also pointed out by Alshaikh et al. (2016).

Lack of gyms designated for women in KSA is another challenge. Participants believed that women are capable of participating in physical exercise if they have their own gyms. The presence of gyms designated for women is important because they make it possible for women to exercise adequately and efficiently at their own convenience and without the need of assistance. White, Randsdell, Vener and Flohr (2005) noted that physical exercise is important in reducing the incidence of T2D.

### **7.5.2 Communication Challenges**

KSA's cultural and socioeconomic nuances contribute significantly to communication challenges that hinder the effectiveness of self-management education support in controlling T2D. The respondents in this study reported that most of the nurses working in the Diabetes Centre are foreigners. The language barrier contributes to ineffective forms of communication, which limits understanding of self-management education support in controlling T2D (Elkharam et al., 2013).

Al-Khathami et al. (2010) point out that KSA's healthcare, particularly nursing care, is largely delivered by a foreign labour force. This is consistent with the findings in this research. The vast majority of nursing professionals in the current study were non-Arabic-speaking individuals from diverse cultural backgrounds. This has contributed to linguistic diversity and a marked language barrier between the Arabic-speaking patients and foreign nurses. Consequently, these nurses are unable comprehensively to understand the fears, doubts and anxieties felt by patients during nursing care delivery.

The nurse participants pointed out the reduced engagement from the patients' side, especially in compliance with treatment. They believed that most patients do not take instructions from their HCP seriously and this limits the process of self-management education support. Delamater (2006) pointed out that regimen adherence problems are common in individuals with diabetes. To improve T2D patient outcomes, it is important for patients to comply with information that they receive from their HCP (Meuter, Gallois, Segalowicz, Ryder and Hocking (2015).

## **7.6 Conclusion**

This research project intended to investigate three objectives focussed on T2D self-management support in three aspects covering level of diabetes knowledge: patients' adherence to self-management activities for T2D; nurses' behaviour in regard to T2D patient care; and challenges facing the healthcare team when providing education support to T2D patients at KFMC.

To achieve this goal, a mixed methods approach was utilised for this study in three phases. Phase 1 was a quantitative study that measured the level of diabetes knowledge among patients, using the DKT and SDSCA to indicate patient adherence to diabetes self-management. The DAS-3 was used for Phase 2 to consider healthcare team (nurses and clinical educators) behaviour with regard to T2D care. Finally, a qualitative study was used for Phase 3 to explore challenges facing the healthcare team when providing self-management education support to patients in the Diabetes Centre at KFMC.

The number of patients participating in Phase 1 was 247; 1,126 nurses and clinical educators participated in Phase 2; and there were 13 participants in Phase 3. Patients and healthcare team members (nurses and clinical educators) in Phase 1 and 3 were recruited from the Diabetes Centre at KFMC. The participants (nurses and clinical educators) in Phase 2 were from the whole Nursing Department across KFMC.

The results of Phase 1 (DKT) included that the majority of participants had an acceptable level knowledge regarding T2D, whereas 36% had only a good level and 27% had a poor level of knowledge. Patients reported the highest adherence to medication-related activities whereas adherence to blood and foot care was at an average level and adherence to diet and exercise-related activities was poor.

Concerning Phase 2, nurses and clinical educators were in strong agreement that diabetes care requires special training. Nurses were also aware that diabetic patients should participate in planning their own care plans and deciding their own glycaemic goals, as determined by the patient autonomy domain. Nurses were also aware of the psychological impact of T2D on patients. However, there was a problem when it came to the perception of the seriousness of diabetes: there was divergence of opinions when it came to nurses' perceptions regarding the seriousness of diabetes. The same was noted for their perception relating to the value of tight glycaemic control.

In Phase 3, the healthcare team in the Diabetes Centre highlighted several challenges that were divided into two themes: cultural and communication challenges. With regard to cultural challenges, participants declared that T2D patients in KSA experienced obstacles that influenced their diabetes management, including misconceptions, a sedentary lifestyle, women's needs and food habits. The nurses explained that the communication challenges they face are language barriers as well as patients' engagement in their treatment plan.

## **Chapter 8: Conclusion and Recommendations**

### **8.1 Introduction**

This research is summed up in this chapter and recommendations are made based on the findings. Highlights about the strengths and challenges discovered during the course of the research are also included and detailed. The chapter outlines future research prospects in areas that were not sufficiently covered but are study related to the study questions. The study sought to focus on diabetes self-management education support for T2D patients in Riyadh, a city in KSA. The research questions specifically focussed on the risk factors and knowledge level of patients, their resilience in terms of self-management activities, the behaviour of clinical educators and nurses regarding diabetes care, and the challenges associated with education support. To do so efficiently and accurately, the research incorporated mixed methods. The following section summarise the outcomes of the study.

### **8.2 Summary of the Study Findings**

The objectives and research questions sought to investigate T2D self-management support in three aspects covering the level of diabetes knowledge, patients' adherence to self-management activities for T2D, nurses' behaviour and traits in regard to T2D patient care and the challenges facing the healthcare team in their provision of education support and awareness of T2D at KFMC.

To achieve the set objectives, it was essential for the study to utilise a mixed methods approach. Efficient employment and incorporation of mixed methods was vital for a quality outcome. The approach was applied in three ways. In the first phase, a study was carried out to measure the level of diabetes knowledge among patients, using the DKT. In addition, the SDSCA was used to measure the adherence of patients to their self-management plans. For Phase 2, the DAS-3 was used to consider the healthcare team (nurses and clinical educators) behaviours in regard to T2D care. In Phase 3, qualitative research was undertaken to examine problems facing the healthcare team in their provision of education support and awareness of T2D in the Diabetes Centre at KFMC.



To make the mixed methods approach effective, a study population was allocated for each phase. Patients and healthcare personnel were allocated as follows: 247 patients in Phase 1; 1,126 nurses and clinical educators in Phase 2; and 13 participants in Phase 3. The study population was acquired from the Diabetes Centre for Phase 1 and 3, which included both patients and the medical team. For Phase 2, all participants including the clinical educators and nurses were sourced from the Nursing Department of KFMC.

Phase 1 generally provided positive feedback as it was shown that 37% of respondents had a good level of knowledge on T2D; 27% had a poor level of knowledge. The results for this phase are still quite close in range, which shows that despite a larger share of the population being knowledgeable, much remains to be done to ensure accessibility and availability of information on T2D. Patients reported the highest adherence to medication-related activities, while adherence to blood and foot care were at an average level and there was only poor adherence to diet and exercise-related activities.

Concerning Phase 2, nurses and clinical educators agreed strongly that diabetes carers need special training. Nurses were also aware that diabetic patients should participate in planning their own care plans and deciding their own glycaemic goals. Nurses were also aware of the psychological impact of T2D. However, there was divergence in opinions when it came to nurses' perceptions regarding the seriousness of diabetes and the value of tight glycaemic control.

In Phase 3, the healthcare team in the Diabetes Centre highlighted several challenges that fell into cultural and communications themes. With respect to cultural challenges, participants declared that T2D patients in KSA experienced obstacles that affect their diabetes management, including misconceptions, a sedentary lifestyle, women's needs and food habits. Nurses explained the communication challenges they are facing due to language barriers as well as patient engagement in their treatment plan.

### **8.3 Strengths**

The study has many strengths, a major one being the translation and validation process used to ensure the DKT instrument would produce valid data. The acceptable psychometric properties of the DKT means it can be used to assess the level of diabetes knowledge of Arabs with T2D of all nationalities, including Arabic speakers living in non-Arab countries.

The use of a triangulation (mixed methods) approach was another major strength of this study. Using this approach facilitated incorporation of the findings from the quantitative and qualitative methods and provided a better and more holistic understanding of diabetes self-management strategies (Speziale et al., 2011). Daymon and Holloway (2010) suggested that the use of a mixed methods approach helps to explore a range of aspects within a single study; thus, generation of a significant amount of data is more feasible than with a single method.

Most importantly, the findings of this study can serve as an effective distribution channel for knowledge of diabetes. For example, channels such as peer-reviewed publications, which can attract the attention of healthcare planners, decision makers and healthcare providers with respect to factors that affect the level of diabetes knowledge as well as challenges that healthcare providers are facing in the KSA. Further, the study focussed attention on the need to develop and improve self-management strategies in diabetes care centres.

### **8.4 Limitations**

This study was limited to a sample of patients attending a public tertiary care hospital in the Riyadh region. Therefore, the results may not apply to patients in primary and secondary care or in private health settings.

This study was limited to patients with T2D; hence, the results may not apply to T1D patients. The study was also limited to 247 respondents so it cannot be generalised to all people with T2D. The other limitation of the study was that it relied entirely on the

responses of the research participants. It is possible that respondents provided inaccurate information, hence misleading the research.

The study included only nurses, and not other healthcare providers such as pharmacists and physicians, because nurses were the main focus of the study. Including other types of HCPs in the study would have provided insights from a different perspective regarding attitudes towards T2D and how various HCPs communicate and deal with diabetic patients.

Another limitation was that convenience sampling was used for the current study. This may make it difficult to generalise the results to the whole Saudi population. Also, only nurses from one medical centre were used, unlike other studies that included HCPs from several centres. This may influence the external validity of the study and the generalisation of results to nurses all over KSA.

The other limitation of this study was that it did not consider patients' perceptions regarding the challenges of diabetes self-management practices. It would have been of great value to ask patients about the effectiveness of diabetes self-management practices in KSA. Also, the families/caregiver of patients may have provided useful information about the barriers to effective self-management practice.

## **8.5 Recommendations and Future Research**

The essence of this study is to explore how to increase the acquisition of knowledge by people about T2D. This can be achieved by the government via establishing programs that provide education to all. Knowledge is power, as discussed earlier, and for this reason the government could set out to initiate programs in which medical personnel meet with people to provide counsel on issues regarding the disease. This could be achieved through door-to-door campaigns where easier access to information about the disease is assured for each individual in the country. Mass production of brochures on T2D could be in circulation, courtesy of the government. The government could collaborate with health institutions to ensure that information is accessible to all. The brochures could be distributed in markets, places of religious gatherings, financial institutions and other areas that are frequented to ensure easy distribution to and access by individuals.

The government could also establish special training institutions to ensure quality provision of services to various patients. There is a difference in the care needed for other patients and for T2D patients. As such, nurses and other medical personnel may seek to attend forums, seminars and workshops aimed at ensuring quality provision of healthcare to diabetes patients. Such forums could be organised by the government in conjunction with health institutions, non-governmental institutions and international health bodies such as the WHO.

The government can also establish a fund or funding initiative to cater solely to patients and other people affected by T2D. Although there is allocation of funds to the health sector to cater for the usual health facilities and provision of services, it is essential that the government establish a separate fund specifically for T2D. Such funds would enable mass production of education materials to aid in transfer of knowledge to the public. Road shows and trips to promote awareness of T2D could also be funded. This would ensure full allocation of funds to support the disease and not generalise the funds to all diseases, as is the case with allocation of funds to the health sector. Eventually, this would breed easier accountability.

Forums might also be run to discuss issues facing diabetics. This would serve to add knowledge as well as clarify misconceptions about the disease. It would also bring about confidence among diabetics who would have a public voice.

Future research could focus on T1D to provide safe living for patients and circulation of information. It would have been of great value to investigate the patient's perceptions about the effectiveness of diabetes self-management practices in KSA. Also, the families/caregiver of patients may have provided useful information about the barriers to effective self-management practice. Moreover, more research can be done on preventive measures for the disease to serve the public. In addition, further assessments can be carried out on other medical personnel to ensure that they are qualified to diagnose patients correctly and without doubt.

Research could be conducted to discover the implications of both T1D and T2D for workers. Diabetics, like other people, must work to make a living. The pressing question

here is how they cope; for example, it would not be easy for diabetics to work in jobs such as mining, due to strain or fatigue. Moreover, such research would help the public to understand how the government is involved in ensuring diabetics achieve favourable working conditions, and help clear any present doubts about the diabetic work force and provide motivation to victims.

## **8.6 Conclusion**

In conclusion, this study was of benefit to the people of KSA as it provided new knowledge on diabetes. The study findings also provide important information to the public and health officials, especially regarding T2D. These findings are not limited to KFMC, but should be made available to all. To ensure this, proper distribution of this knowledge is essential, via channels such as publications and posters.

The study highlights that there is still room for much work to be done. This includes special training for health workers to ensure quality in the delivery of information to the public, and thus quality healthcare. Equipping healthcare personnel with the relevant information will ensure that they boost their confidence and thus their accuracy in information delivery.

Also, as proper diagnosis and subsequent treatment is of essence, the KSA government should seek to invest in ensuring proper service delivery and better accessibility of programs and institutions that can help with issues related to diabetes. The involvement of the government in the disease issue will go a long way towards improving the lives of diabetics. This should begin with the establishment of separate funds for diabetics, which should be well managed. The government and non-governmental institutions should seek to deliver forums, workshops and seminars to aid in the awareness of T2D. Similar research should also be undertaken in the future focussing on other types of diabetes including T1D, to further enlighten the public about the disease and thereby avoid circulation of inadequate information.

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## Appendices

### Appendix A: Diabetes Knowledge Test Survey

**1. The diabetes diet is:**

- a) The way most American people eat
- b) A healthy diet for most people
- c) Too high in carbohydrate for most people
- d) Too high in protein for most people

**2. Which of the following is highest in carbohydrate?**

- a) Baked chicken
- b) Swiss cheese
- c) Baked potato
- d) Peanut butter

**3. Which of the following is highest in fat?**

- a) Low fat (2%) milk
- b) Orange juice
- c) Corn
- d) Honey

**4. Which of the following is a “free food”?**

- a) Any unsweetened food
- b) Any food that has “fat free” on the label
- c) Any food that has “sugar free” on the label
- d) any food that has less than 20 calories per serving

**5. A1C is a measure of your average blood glucose level for the past:**

- a) Day
- b) Week
- c) 6-12 weeks
- d) 6 months

**6. Which is the best method for home glucose testing?**

- a) Urine testing
- b) Blood testing
- c) Both are equally good

**7. What effect does unsweetened fruit juice have on blood glucose?**

- a) Lowers it
- b) Raises it
- c) Has no effect

**8. Which should not be used to treat low blood glucose?**

- a) 3 hard candies
- b) 1/2 cup orange juice
- c) 1 cup diet soft drink
- d) 1 cup skim milk

**9. For a person in good control, what effect does exercise have on blood glucose?**

- a) Lowers it

- b) Raises it
- c) Has no effect

**10. What effect will an infection most likely have on blood glucose?**

- a) Lowers it
- b) Raises it
- c) Has no effect

**11. The best way to take care of your feet is to:**

- a) Look at and wash them each day
- b) Massages them with alcohol each day
- c) Soak them for one hour each day
- d) Buy shoes a size larger than usual

**12. Eating foods lower in fat decreases your risk for:**

- a) Nerve disease
- b) Kidney disease
- c) Heart disease
- d) Eye disease

**13. Numbness and tingling may be symptoms of:**

- a) Kidney disease
- b) Nerve disease
- c) Eye disease
- d) Liver disease

**14. Which of the following is usually not associated with diabetes:**

- a) Vision problems
- b) Kidney problems
- c) Nerve problems
- d) Lung problems

## أستبيان اختبار المعرفة لمرض السكري

السلام عليكم ورحمة الله وبركاته

اشكرك على المشاركة في هذه الدراسة والاخذ من وقتك لتعبئة هذا الاستبيان.

### معلومات عامة:

رقم السجل الطبي: ..... معدل السكر التراكمي (HbA1c):

العمر (بالسنوات) : 18-30 ☐ 31-45 ☐ 46-55 ☐ 56 او اكثر ☐

الجنس: ذكر ☐ انثى ☐

معدل الدخل الشهري: 5000 او اقل ☐ 7500 او اقل ☐ 10000 او اقل ☐ 11000 او اكثر ☐

مستوى التعليم: غير متعلم ☐ ابتدائي ☐ متوسط ☐ ثانوي ☐ جامعي ☐ تعليم عالي ☐

هل انت مدخن: نعم ☐ لا ☐ مدخن سابق ☐

الفترة منذ اصابتك بالسكري (السنوات): اقل من سنتين ☐ 2-4 ☐ 5-7 ☐ 8-10 ☐ 10 او اكثر ☐

هل يوجد لديك امراض: قلب ☐ ضغط ☐ كلى ☐ عيون ☐

### 1. النظام الغذائي لمرض السكري هو:

☐ الطريقة التي يأكل بها السعوديين

☐ النظام الغذائي لمعظم الناس

☐ النظام الذي يحتوي على نسبة عالية من الكربوهيدرات لمعظم الأشخاص

☐ النظام الذي يحتوي على نسبة عالية من البروتين لمعظم الأشخاص

### 2. أي من الأغذية التالية يحتوي على نسبة عالية من الكربوهيدرات؟

☐ الدجاج المشوي

☐ جبنة بيضاء

☐ بطاطس مشوية

☐ زبدة الفول السوداني

### 3. أي من الأطعمة التالية يحتوي على نسبة عالية من الدهون؟

☐ حليب قليل الدسم

☐ عصير برتقال

☐ ذرة

☐ عسل

### 4. أي من الأطعمة التالية يعتبر خالي من الكربوهيدرات؟

☐ الأطعمة الغير محلاة

☐ طعام الحمية الغذائية

☐ أي طعام عليه علامة خالي من السكر

☐ أي طعام يحتوي على أقل من 20 سعره حراريه

### 5. اختبار خضاب الدم السكري (معدل السكر التراكمي) هو احد الاختبارات التي تقيس متوسط مستوى السكر في

الدم قبل:

☐ يوم

☐ أسبوع

- ☐ 6 الي-10 أسابيع
- ☐ 6 أشهر
6. ماهي افضل الطرق التالية لفحص سكر الدم في المنزل؟
- ☐ فحص البول
- ☐ فحص الدم
- ☐ كلاهما جيد
7. ما هو تأثير عصير الفاكهة الغير محلاة على مستوى السكر في الدم؟
- ☐ يخفض منه
- ☐ يؤدي الى ارتفاعه
- ☐ ليس له تأثير
8. أي من التالي لا يجب تناولة لعلاج سكر الدم المنخفض ؟
- ☐ ثلاث حبات من التمر
- ☐ نصف كوب عصير برتقال
- ☐ كوب مشروب غازي خالي من السكر
- ☐ كوب حليب قليل الدسم
9. ما هو تأثير التمارين الرياضية على مستوى سكر الدم ، بالنسبة للشخص المتحكم بمعدل جيد للسكري ؟
- ☐ تقلل منه
- ☐ تساهم في زيادته
- ☐ ليس لها تأثير
10. ماهو تأثير العدوى المتوقع على سكر الدم :
- ☐ ارتفاع في سكر الدم
- ☐ انخفاض في سكر الدم
- ☐ لا تؤثر عليه
11. أفضل وسيلة لرعاية قدميك
- ☐ الاهتمام بها و غسلها يوميا
- ☐ التدليك بالكحول يوميا
- ☐ نقعها لمدة ساعة يوميا
- ☐ شراء حذاء بمقاس أكبر من المعتاد
12. تناول أطعمة قليلة الدسم يقلل من خطورة الإصابة بـ :
- ☐ امراض الاعصاب
- ☐ أمراض الكلى
- ☐ أمراض القلب
- ☐ أمراض العين
13. الشعور بالوخز و التتميل قد يكون احد أعراض :
- ☐ أمراض الكلى
- ☐ أمراض الأعصاب
- ☐ أمراض العين
- ☐ مرض بالكبد
14. أي مما يلي عادتاً لا يرتبط بمرض السكري :
- ☐ مشاكل بالرؤية
- ☐ مشاكل بالكلى
- ☐ المشاكل العصبية
- ☐ مشاكل بالرئة

## Appendix B: Summary of Diabetes Self-Care Activities Survey

Diet		
1	During the last seven days, for how many days you follow a healthy diet?	0-1-2-3-4-5-6-7
2	How well did you follow your diet during the last month (rate of days in the week)	0-1-2-3-4-5-6-7
3	On how many of the last seven days did you space carbohydrates evenly through the day?	0-1-2-3-4-5-6-7
Exercise		
4	During the last seven days, for how many days did you practice physical activities in general for at least 30 minutes? (Total minutes of activities including walking)	0-1-2-3-4-5-6-7
5	During the last seven days, for how many days did you practice a strict training exercise session (such as swimming, walking...etc.) exclude activities that are performed around your house or at your work?	0-1-2-3-4-5-6-7
Blood sugar testing		
6	During the last seven days, for how many days did you test your blood sugar level?	0-1-2-3-4-5-6-7
7	During the last seven days, for how many days did you test your blood sugar level according to your physician's instructions?	0-1-2-3-4-5-6-7

Foot care		
-----------	--	--

- |    |                                                                                                                                                                          |                 |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 8  | During the last seven days, for how many days did you check your feet?                                                                                                   | 0-1-2-3-4-5-6-7 |
| 9  | During the last seven days, for how many days did you check the interior of your shoes (to insure that there are no materials that could cause any injury to your feet)? | 0-1-2-3-4-5-6-7 |
| 10 | On how many of the last SEVEN DAYS did you wash your feet?                                                                                                               | 0-1-2-3-4-5-6-7 |
| 11 | On how many of the last SEVEN DAYS did you soak your feet?                                                                                                               | 0-1-2-3-4-5-6-7 |
| 12 | On how many of the last SEVEN DAYS did you dry between your toes after washing?                                                                                          | 0-1-2-3-4-5-6-7 |

Medication		
------------	--	--

- |    |                                                                                            |                 |
|----|--------------------------------------------------------------------------------------------|-----------------|
| 13 | On how many of the last SEVEN DAYS did you take your recommended insulin injections?       | 0-1-2-3-4-5-6-7 |
| 14 | On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills? | 0-1-2-3-4-5-6-7 |



### **Self-care recommendations**

Which of the following has your health care team advised you to do? (Extended SDSCA survey diet domain)

- 
- ☐ Follow a low-fat eating plan?
  - ☐ Follow a complex carbohydrate diet?
  - ☐ Reduce the number of calories you eat to lose weight?
  - ☐ Eat lots of food high in dietary fibre?
  - ☐ Eat lots (at least, five servings per day) of fruit and vegetables?
  - ☐ Eat very few sweets?
  - ☐ Other
  - ☐ I have not been given any advice about my diet by my healthcare team
- 

Which of the following has your health care team advised you to do? (Extended SDSCA Survey Exercise Domain)

- 
- ☐ Do low-level exercise (such as walking) on a daily basis?
  - ☐ Exercise continuously for a least 20 minutes at least three times a week?
  - ☐ Fit exercise into your daily routine (e.g. take stairs instead of elevators, park a block away and walk)?
  - ☐ Engage in a specific amount, type, duration and level of exercise?
  - ☐ Other
  - ☐ I have not been given advice about exercise by healthcare team
- 

Which of the following has your health care team advised you to do? (Extended SDSCA Survey Blood Sugar Domain)

- 
- ☐ Test your blood sugar using a machine to read the result?
  - ☐ Test your urine for sugar?

☐ Other

☐ I have not been given any advice either about testing my blood or urine sugar level by my healthcare team

---

Which of the following medications for your diabetes has your doctor prescribed?

(Extended SDSCA Survey Prescribed Medication Domain)

---

☐ An insulin shot 1 or 2 times a day?

☐ An insulin shot 3 or more times a day?

☐ Diabetes pills to control your blood sugar level?

☐ Other

☐ I have not been prescribed either insulin or pills for my diabetes

---

## أستبيان موجز الانشطة الشخصية لرعاية السكري

الاسئلة بالاسفل تهدف الى معرفة انشطتك الشخصية للعناية بالسكري خلال السبعة ايام الماضية. اذا كنت مريضاً خلال السبعة ايام الماضية الرجاء العودة الى اخر سبعة ايام لم تكن مريضاً بها اعتماداً على هذا اليوم كنهاية للفترة التي قررت تسجيلها الرجاء وضع دائرة على الاجابة الصحيحة.

التغذية	
1	خلال السبعة ايام الماضية، كم عدد الايام التي اتبعت فيها نظام غذاء صحي؟ 0-1-2-3-4-5-6-7
2	مامدى اتباعك لنظامك الغذائي خلال الشهر الماضي (كم معدل الايام خلال الاسبوع)؟ 0-1-2-3-4-5-6-7
3	خلال السبعة ايام الماضية، كم عدد الايام التي تناولت فيها كمية النشويات اليومية خلال اليوم بالتساوي (كمية متساوية من النشويات في الفطور والغداء والعشاء او باقي وجباتك الغذائية) 0-1-2-3-4-5-6-7
الرياضة	
4	خلال السبعة ايام الماضية، كم عدد الايام التي مارست فيها أنشطة بدنية بصفة عامة لمدة 30 دقيقة على الأقل (مجموع الدقائق الكلية للأنشطة بما فيها المشي)؟ 0-1-2-3-4-5-6-7
5	خلال السبعة ايام الماضية، كم عدد الايام التي مارست فيها تمرين رياضي محدد (السباحة ، المشي...الخ) عدا تلك التي تقوم بها في محيط منزلك او اللتي تكون جزءاً من عملك؟ 0-1-2-3-4-5-6-7
فحص سكر الدم	
6	خلال السبعة ايام الماضية، كم عدد الايام التي فحصت فيها سكر الدم؟ 0-1-2-3-4-5-6-7
7	خلال السبعة ايام الماضية، كم عدد الايام التي فحصت فيها سكر الدم حسب المذكور في تعليمات طبيبك؟ 0-1-2-3-4-5-6-7
العناية بالقدم	
8	خلال السبعة ايام الماضية، كم عدد الايام التي فحصت فيها قدميك؟ 0-1-2-3-4-5-6-7
9	خلال السبعة ايام الماضية، كم عدد الايام التي فحصت فيها حذائك من الداخل (للتأكد من عدم وجود اشياء تسبب الجروح مثل قطع في الحذاء او نتوءات)؟ 0-1-2-3-4-5-6-7
10	خلال السبعة ايام الماضية، كم عدد الايام التي غسلت فيها قدميك؟ 0-1-2-3-4-5-6-7
11	خلال السبعة ايام الماضية، كم عدد الايام التي نعتت فيها قدميك بالماء؟ 0-1-2-3-4-5-6-7
12	خلال السبعة ايام الماضية، كم عدد الايام التي جففت فيها بين اصابع قدميك بعد الغسيل؟ 0-1-2-3-4-5-6-7
قسم العلاج	
13	خلال السبعة ايام الماضية ، كم عدد الايام التي اخذت فيها حقنة الانسولين الموصى بها خلال اليوم؟ 0-1-2-3-4-5-6-7
14	خلال السبعة ايام الماضية ، كم عدد الايام التي تناولت فيها حبوب السكر خلال اليوم؟ 0-1-2-3-4-5-6-7

## قسم النصائح الطبية للعناية الشخصية

أي مما يلي نصحك الفريق الطبي بان تعمل حول التغذية:

- ☐ اتباع حمية غذائية قليلة الدسم
- ☐ اتباع حمية غذائية من النشويات المركبة (مثل الارز والمكرونه)
- ☐ تقليل عدد السعرات الحرارية التي تاكلها لتخفيض الوزن
- ☐ تناول اطعمة غنية بالالياف (مثل الخضروات)
- ☐ تاكل كثيراً من الفواكه والخضروات (على الاقل خمسة يومياً)
- ☐ تناول كميات قليلة من الحلوى (مثل تحلية بعد الطعام)
- ☐ أخرى (حدد) .....
- ☐ لم اتلقى أية نصيحة حول التغذية من قبل الفريق الصحي

أي مما يلي نصحك الفريق الطبي بان تعمل حول ممارسة التمارين الرياضية:

- ☐ ممارسة تمارين رياضية بسيطة (مثل المشي) بشكل يومي
- ☐ ممارسة تمارين مستمرة لمدة 20 دقيقة 3 مرات اسبوعياً
- ☐ ممارسة تمارين لياقة في عاداتك اليومية (مثلا استخدام الدرج بدلا عن المصعد، اوقف سيارتك بعيداً ثم امشي تلك المسافة ....الخ)
- ☐ الارتباط بنوع او عدد او مدة معينة من مستوى التمرين
- ☐ أخرى (حدد) .....
- ☐ لم اتلقى أية نصيحة حول التغذية من قبل الفريق الصحي

أي مما يلي نصحك الفريق الطبي بان تعمل حول فحص السكر

- ☐ فحص سكر الدم باستخدام الجهاز لمعرفة النتيجة
- ☐ فحص البول السكري
- ☐ أخرى (حدد) .....
- ☐ لم اتلقى أية نصيحة حول فحص سكري البول او سكري الدم من قبل الفريق الصحي

أي مما يلي نصحك الفريق الطبي بان تعمل حول

- ☐ ماهي الادوية التي وصفها لك طبيبك للسكري:
- ☐ حقنة انسولين مرة الي مرتين يومياً
- ☐ حقنة انسولين 3 مرات أو اكثر يومياً
- ☐ حبوب سكري لطبط مستوى سكري الدم
- ☐ أخرى(حدد) .....
- ☐ لم اتلقى من الفريق الصحي أية وصفة سواء حقن انسولين او حبوب لمرضى السكري

## Appendix C: Diabetes Attitude Survey

### Diabetes Attitude Survey

Below are some statements about diabetes. Each numbered statement finishes the sentence “In general, I believe that...” You may believe that a statement is true for one person but not for another person or may be true one time but not be true another time. Mark the answer that you believe is true most of the time or is true for most people. Place a check mark in the box below the word or phrase that is closest to your opinion about each statement. It is important that you answer every statement.

Note: The term “health care professionals” in this survey refers to doctors, nurses, and dieticians.

	<b>Strongly Agree</b>	<b>Agree</b>	<b>Neutral</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
<b>In general, I believe that:</b>					
1. ...health care professionals who treat people with diabetes should be trained to communicate well with their patients.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. ...people who do <u>not</u> need to take insulin to treat their diabetes have a pretty mild disease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. ...there is not much use in trying to have good blood sugar control because the complications of diabetes will happen anyway.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. ...diabetes affects almost every part of a diabetic person’s life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. ...the important decisions regarding daily diabetes care should be made by the person with diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. ...health care professionals should be taught how daily diabetes care affects patients’ lives.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

In general, I believe that:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7. ...older people with Type 2* diabetes do not usually get complications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. ...keeping the blood sugar close to normal can help to prevent the complications of diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. ...health care professionals should help patients make informed choices about their care plans.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. ...it is important for the nurses and dietitians who teach people with diabetes to learn counseling skills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. ...people whose diabetes is treated by just a diet do not have to worry about getting many long-term complications.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. ...almost everyone with diabetes should do whatever it takes to keep their blood sugar close to normal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. ...the emotional effects of diabetes are pretty small.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\*Type 2 diabetes usually begins after age 40. Many patients are overweight and weight loss is often an important part of the treatment. Insulin and/or diabetes pills are sometimes used in the treatment. Type 2 diabetes is also called noninsulin-dependent diabetes mellitus or NIDDM; formerly it was called “adult diabetes.”

In general, I believe that:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
14. ...people with diabetes should have the final say in setting their blood glucose goals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. ...blood sugar testing is not needed for people with Type 2* diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. ...low blood sugar reactions make tight control too risky for most people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. ...health care professionals should learn how to set goals with patients, not just tell them what to do.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. ...diabetes is hard because you never get a break from it.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. ...the person with diabetes is the most important member of the diabetes care team.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. ...to do a good job, diabetes educators should learn a lot about being teachers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. ...Type 2* diabetes is a very serious disease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. ...having diabetes changes a person's outlook on life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\*Type 2 diabetes usually begins after age 40. Many patients are overweight and weight loss is often an important part of the treatment. Insulin and/or diabetes pills are sometimes used in the treatment. Type 2 diabetes is also called noninsulin-dependent diabetes mellitus or NIDDM; formerly it was called "adult diabetes."

In general, I believe that:	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
23. ...people who have Type 2* diabetes will probably not get much payoff from tight control of their blood sugars.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. ...people with diabetes should learn a lot about the disease so that they can be in charge of their own diabetes care.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. ...Type 2* is as serious as Type 1† diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. ...tight control is too much work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. ...what the patient does has more effect on the outcome of diabetes care than anything a health professional does.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. ...tight control of blood sugar makes sense only for people with Type 1† diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\*Type 2 diabetes usually begins after age 40. Many patients are overweight and weight loss is often an important part of the treatment. Insulin and/or diabetes pills are sometimes used in the treatment. Type 2 diabetes is also called noninsulin-dependent diabetes mellitus or NIDDM; formerly it was called “adult diabetes.”

†Type 1 diabetes usually begins before age 40 and always requires insulin as part of the treatment. Patients are usually not overweight. Type 1 diabetes is also called insulin-dependent diabetes mellitus or IDDM; formerly it was called “juvenile diabetes.”



	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<b>In general, I believe that:</b>					
29. ...it is frustrating for people with diabetes to take care of their disease.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. ...people with diabetes have a right to decide how hard they will work to control their blood sugar.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. ...people who take diabetes pills should be as concerned about their blood sugar as people who take insulin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. ...people with diabetes have the right <u>not</u> to take good care of their diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. ...support from family and friends is important in dealing with diabetes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Appendix D: Permission to use the Diabetes Knowledge Test and Diabetes Attitude Scale-3



Ali Alhaiti <s3510090@student.rmit.edu.au>

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### Permission: To use your survey instrument

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**Campbell, Pam** <pamcamp@med.umich.edu>

24 August 2015 at 19:27

To: Ali Alhaiti <s3510090@student.rmit.edu.au>

Cc: "debtack@umich.edu" <debtack@umich.edu>, "Hardy, Sandy" <skhardy@med.umich.edu>

Dear Mr. Alhaiti,

Please feel free to use our survey instrument(s). We just ask that you cite our center as follows: the project described was supported by Grant Number P30DK092926 (MCDTR) from the National Institute of Diabetes and Digestive and Kidney Diseases.

Thank you,

*Pam Campbell*

*Michigan Diabetes Research Center*

*Michigan Center for Diabetes Translational Research*

*University of Michigan Medical School*

*1000 Wall Street, RM# 6100*

*Brehm Tower*

*Ann Arbor, Michigan 48105*

*Tel: 734-763-5730*

*Fax: 734-647-2307*

Remember to cite the Michigan Diabetes Research Center (MDRC) and/or the Michigan Center for Diabetes Translational Research (MCDTR) in publications:

"The project described was supported by Grant Number P30DK020572 (MDRC) from the National Institute of Diabetes and Digestive and Kidney Diseases" OR the project described was supported by Grant Number P30DK092926 (MCDTR) from the National Institute of Diabetes and Digestive and Kidney Diseases."

## Appendix E: Permission to use the Summary of Diabetes Self-Care Activities Survey



Ali Alhaiti <s3510090@student.rmit.edu.au>

طلب تفويض استخدام اداة الاستبيان

2 messages

RMIT <s3510090@student.rmit.edu.au>

2 December 2014 at 19:29

To: "Aljohani.khalid@gmail.com" <Aljohani.khalid@gmail.com>

السلام عليكم ورحمة الله وبركاته  
الدكتور العزيز خالد الجهني  
اسمي علي الحايطي طالب دكتوراة تخصص عريض في جامعة معهد ملبورن الملكي للتكنولوجيا في استراليا.  
اعمل حاليا على مشروعى البحثي وارغب في استخدام اداة الاستبيان الخاصة بك في أطروحة الدكتوراة .  
إذا كان لا يوجد اي مانع ارجب بالتحدث معك للاستفسار عن بعض الأمور الخاصة بالاستبيان.

شاكر ومقدر تعاونك مقدما  
تحياتي  
علي

Sent from my iPhone

Khalid Aljohani <aljohani.khalid@gmail.com>

3 December 2014 at 19:38

To: RMIT <s3510090@student.rmit.edu.au>

Dear Mr. Ali,  
Thank you for your e-mail. The Summary of Diabetes Self Care (Arabic version) is in public domain. Therefore, you can use the instrument without the need of my permission.  
All the Best

Dr. Khalid AlJohani  
Regional Nursing Director/ Madinah Region, KSA

[Quoted text hidden]

## Appendix F: Ethics approval from RMIT University



17<sup>th</sup> December 2014

George Lenon  
Building 202 Level 2, Room 51  
School of Health Sciences  
RMIT University

Dear George

**ASEHAPP 59-14 LENON-ALHAITI** The lived experience for nurses at home health care program in Saudi Arabia

Thank you for submitting your amended application for review.

I am pleased to inform you that the CHEAN has approved your application for a period of **26 Months** from the date of this letter to **17<sup>th</sup> February 2017** and your research may now proceed.

The CHEAN would like to remind you that:

All data should be stored on University Network systems. These systems provide high levels of manageable security and data integrity, can provide secure remote access, are backed up on a regular basis and can provide Disaster Recover processes should a large scale incident occur. The use of portable devices such as CDs and memory sticks is valid for archiving; data transport where necessary and for some works in progress. The authoritative copy of all current data should reside on appropriate network systems; and the Principal Investigator is responsible for the retention and storage of the original data pertaining to the project for a minimum period of five years.

**Please Note:** Annual reports are due on the anniversary of the commencement date for all research projects that have been approved by the CHEAN. Ongoing approval is conditional upon the submission of annual reports failure to provide an annual report may result in Ethics approval being withdrawn.

Final reports are due within six months of the project expiring or as soon as possible after your research project has concluded.

The annual/final reports forms can be found at:  
[www.rmit.edu.au/staff/research/human-research-ethics](http://www.rmit.edu.au/staff/research/human-research-ethics)

Yours faithfully,

**Dr Linda Jones**  
Chair, Science Engineering & Health  
College Human Ethics Advisory Network

Cc CHEAN Member: Susana Gavidia-Payne School of Health Sciences RMIT University  
Student Investigator/s: Ali Hassan M Alhaiti s3510090 School of Health Sciences RMIT University

RMIT University  
Science Engineering  
and Health  
College Human Ethics  
Advisory Network  
(CHEAN)  
Plenty Road  
Bundoora VIC 3083  
PO Box 71  
Bundoora VIC 3083  
Australia  
Tel. +61 3 9925 7096  
Fax +61 3 9925 6506  
• [www.rmit.edu.au](http://www.rmit.edu.au)

## Appendix G: Ethics approval from King Fahad Medical City

Kingdom of Saudi Arabia  
Ministry of Health  
King Fahad Medical City  
(162)

المملكة العربية السعودية  
وزارة الصحة  
مدينة الملك فهد الطبية  
(١٦٢)

Ministry of Health  
مدينة الملك فهد الطبية  
King Fahad Medical City

IRB Registration Number with KACST, KSA: H-01-R-012  
IRB Registration Number with OHRP/NIH, USA: IRB00008644  
Approval Number Federal Wide Assurance NIH, USA: FWA00018774

April 12, 2015  
IRB Log Number: 15-166  
Department: Nursing  
Category of Approval: EXEMPT

Dear Ms. Loendi,

The Internal Review Board (IRB) has reviewed and approved the submission of Mr. Ali Hassan Alhaiti relating to the research protocol titled 'The Effectiveness of a Self-Management Educational support for People with Type 2 Diabetes in Saudi Arabia'. The IRB approval is from the research ethics point of view only. The authorization to undertake research in KFMC lies in your hands. The research proposal is being sent for your review and decision on the feasibility of carrying out the research in your section and your readiness to provide the necessary assistance. You can inform the researcher of your decision with a copy to us.

Best regards,

**Prof. Omar H. Kasule**  
Chairman Institutional Review Board--IRB.  
King Fahad Medical City, Riyadh, KSA.  
Tel: + 966 1 288 9999 Ext. 26913  
E-mail: okasule@kfmc.med.sa

12 APR 2015  
F M  
Approved  
IRB

مدينة الملك فهد الطبية  
King Fahad Medical City

## Appendix H: Translation Services Letter

09/05/2017.

Dr. W. Jabouri  
NAATI Professional Translator (Arabic<>English)  
NAATI Accreditation No. 30039.

To: RMIT University  
School of Health and Biomedical Sciences

Re.: Arabic translation of Diabetes Knowledge Test Survey  
Project: The Effectiveness of a Self-Management Educational support for People  
with Type 2 Diabetes in Saudi Arabia  
(Investigator: Ali Hassan Alhaiti-RMIT University)

Dear Sir/Madam

I confirm, herewith, that I reversely translated the aforementioned survey, from Arabic into English, on 17/11/2015. Moreover, I confirm the style of the translation as non-literal that takes into account the cultural differences between Australia and Saudi Arabia.

Yours faithfully

Dr. W. Jabouri  
NAATI-Accredited Translator

